Precision Metal Molding

PMM

INCLUDING DIE CASTINGS MAGAZINE

DIE CASTINGS

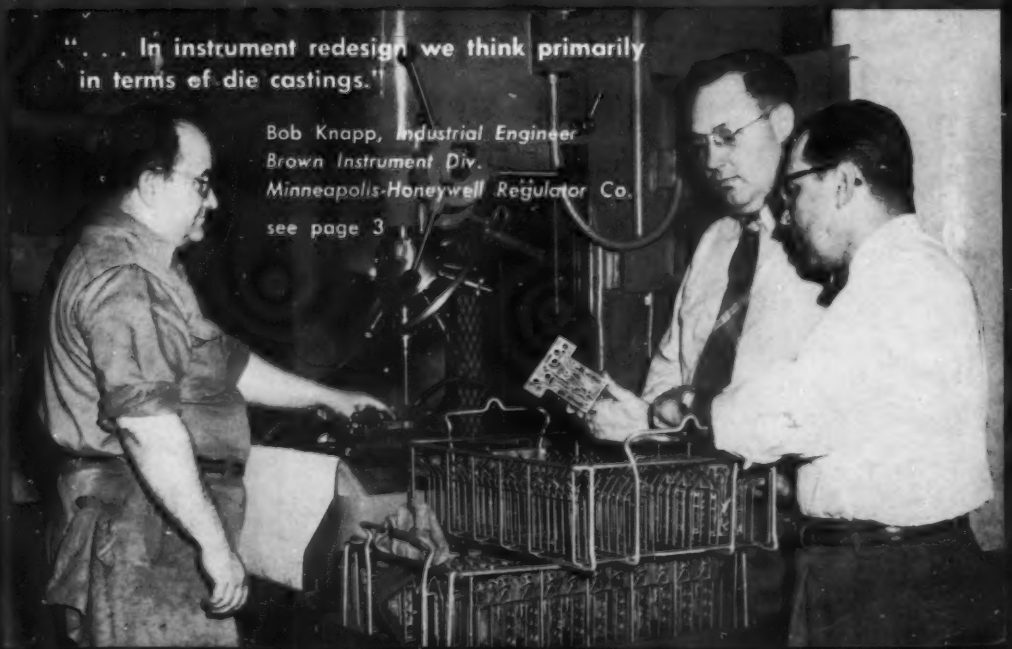
INVESTMENT CASTINGS

PERMANENT MOLD CASTINGS

PLASTER MOLD CASTINGS

POWDER METALLURGY

SHELL MOLD CASTINGS



"... In instrument redesign we think primarily in terms of die castings."

Bob Knapp, *Industrial Engineer*
Brown Instrument Div.
Minneapolis-Honeywell Regulator Co.

see page 3

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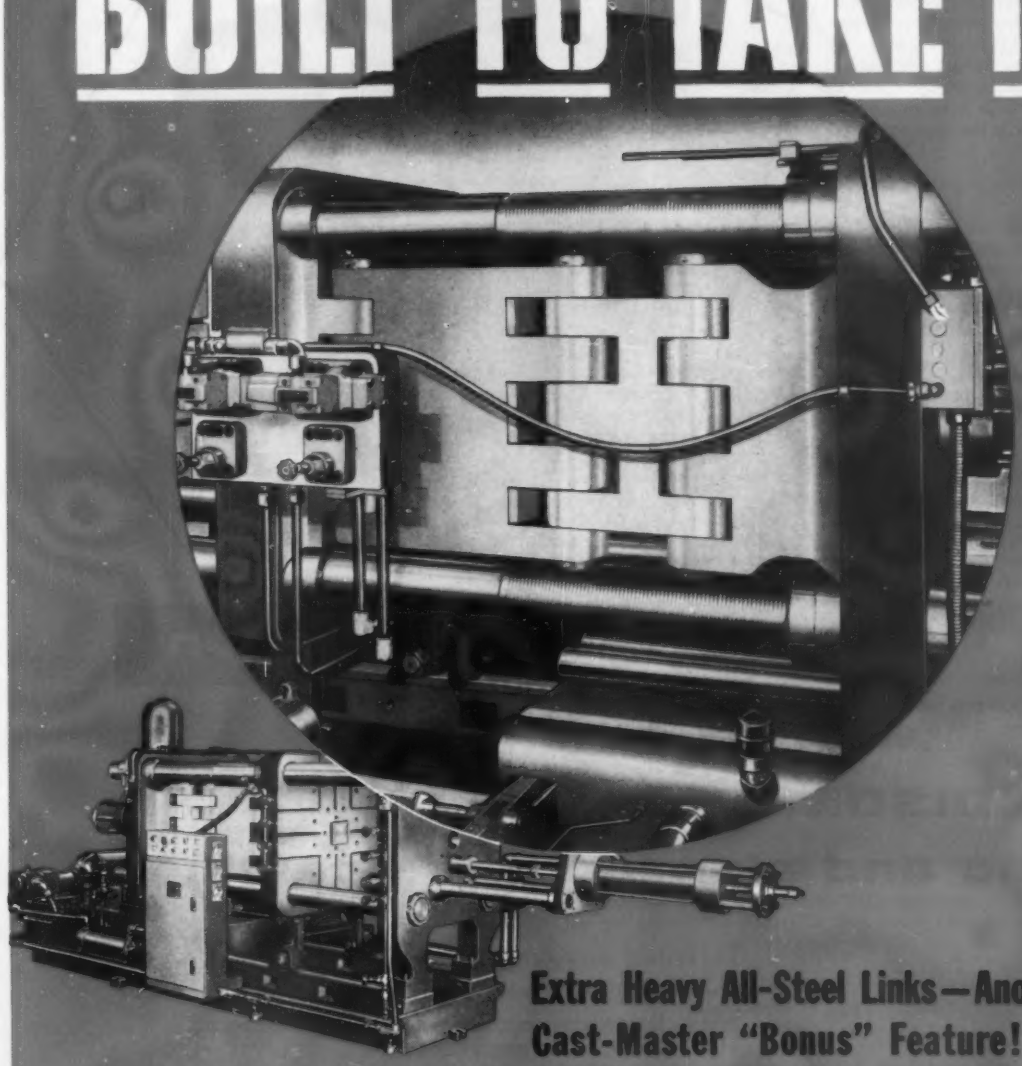
BUILT TO TAKE IT



Extra Heavy All-Steel Links—Another Cast-Master "Bonus" Feature! . . .

The story of Cast-Master quality is a story of "bonus" features — like the link system shown here. Cast-Master links are super-rugged — all-steel — machined — with wide spread for positive lock-up, and multiple shear points to eliminate link pin breakage. Result? — more precision — lower maintenance costs for Cast-Master owners. To get the complete "bonus" story, send for the new Cast-Master catalog. It describes exclusive Cast-Master developments, gives detailed specifications on eight new models that are setting the pace for the industry.

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CAST-MASTER *Inc.*

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maximum process utilization

with

MADISON-KIPP

zinc and aluminum die castings

Die casting as a process has marked advantages in providing lightness, strength and stability in parts that can be cast to dimensions requiring a minimum of machining.

Seasoned skill, however, is involved in getting maximum process utilization as in the Madison-Kipp casting here illustrated, developed with the close cooperation of the user and the die designer.

Please clip this ad as a reminder to contact us when you have die casting requirements.

kipp

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213 WAUBESA STREET • MADISON 10, WIS., U.S.A.

● Skilled in Die Casting Mechanics ● Experienced in Lubrication Engineering ● Originators of Really High Speed Air Tools

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IN THIS ISSUE

August 1957: Volume 15 Number 8

COVER STORY

ONE OF THE JOBS that only die casting can do is the formation of the intricate air channels used in the Tel-O-Set controlling and recording instrument made by the Brown Instrument Div. of Minneapolis-Honeywell Corp. Here George Tranter (right), purchasing engineer, Bob Knapp (center), industrial engineer and a machine operator at a drill press check on machining characteristics of a die cast "T" casting.

FEATURE ARTICLES

35 DESIGN ORIGINALLY FOR DIE CASTING
When a new product is born that may some day be mass produced, the wise engineer will design as many parts as possible for conversion to die casting when quantity production permits.

37 HOW ELSE COULD YOU MAKE IT?
Without die casting the compact, efficient, multi-purpose control unit of this modern control instrument could not be built. The alternative — larger and less efficient.

39 A SLIDING BEARING FOR LIFE-TIME SERVICE
Not all bearings are round. Here is a flat bearing that permits the easy operation of two sliding members in a location that never receives any servicing.

40 A CASTING REPLACES A FORGING
To take advantage of the savings possible with shell molds this company has installed a modern, automatic unit that can make a complete shell mold every 15 seconds.

42 HOT WORK STEELS FOR DIE CASTING DIES
A technical data sheet listing the properties, heat-treatment and chemistry of the more widely used steels for die casting dies.

43 STRONG, DUCTILE, TOUGH STAINLESS SINTERINGS
To save material and eliminate expensive machining operations, a stainless steel sintering is used under conditions of high stress and high humidity.

45 AN OFFSET-TOOTH SPUR GEAR
For power transmission where a helical gear can not be cast due to the high angle, this die cast, off-set tooth spur gear often will substitute satisfactorily.

46 TEXTILE MACHINERY CASTINGS
Resistance to corrosion, wear, and cutting action are needed in textile machinery parts. Investment castings in stainless steel fill the bill and cut manufacturing costs.

FINISHING SECTION

51 A TRIM PRESS WITH BUILT-IN SAFETY
All die castings must be trimmed. This operation can be dangerous for the operator. This press can not move unless the operator is safe. Added is a protective feature for the trim die.

53 HIGH SPEED TAPPING
Most automatic tapping heads require the reversal of the drive motor to remove the tap after the threads have been cut. This unit utilizes a reversing clutch.

55 PRODUCTION LINE SURFACE INSPECTION
Inspection of surface finishes at the production line is now possible with the introduction of a new portable, lightweight instrument.

57 USING GRIP RINGS IN ASSEMBLY
Particularly where die castings are to be assembled, a stud, cast-on, can accept a grip ring for assembly. Thus the machining costs and assembly costs are lowered.

DEPARTMENTS

4	Between the Lines	28	Books	72	New Products
10	Casting About	48	Data in Ads	80	Industry News
22	Letters	60	Useful Literature	83	Opportunities

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BETWEEN THE LINES

the editor's viewpoint on articles in current and forthcoming issues

THE PROPERTIES OF SINTERINGS for extremely severe duty are illustrated in two feature articles in this issue. Sinterings in two different metals have provided designers with the answers to two tough problems, each requiring long life in parts that must undergo rather strenuous service. *Stainless steel sinterings* that are sealed inside the shell of your refrigerator must be strong enough to resist high stresses of the latching mechanism, must withstand corrosion, and must have good ductility. The story is on page 43. On the other hand, *porous bronze bushings* used in school and theater seats outwear solid bronze bushings by a good margin. That story is on page 39.

HOT WORK STEELS FOR DIE CASTING have been tabulated, together with physical properties, composition, and cross-reference, for your convenience. The data sheet, based on information from the steel makers, is published on page 42.

OUR DIE CASTING FORECAST will be the big feature of our September issue for the fourth year in a row. We are now completing the tabulation of statistics and data. What will be included . . . design trends, metals shipments and prospects, sale of die casting machinery and equipment, a 10-page report on mechanized finishing of die castings, opinions of die casting users and producers.

WHAT'S A TYPICAL SHELL MOLD FOUNDRY and what kind of castings does it produce? PMM's market research department surveyed 400 shell mold foundries and came up with an interesting picture. Today's typical shell mold operation is less than five years old, makes castings under five pounds for sale to a very wide range of industries, and operates one or two shell machines. The full report will be published in September.

WAVE GUIDES SHOW THE WAY for many other applications of investment castings. Because of their complexity and extra requirements for accuracy and surface finish, wave guides have caused investment casters to develop special techniques. These improved techniques can, in turn, be used to advantage in getting superior castings for industrial and commercial purposes. The investment casting of wave guide components will be the subject of a feature in September. It may give you an idea of a way to use investment castings for some of your complex components.

MECHANIZED FINISHING holds great promise in the processing of die castings. A major feature in our September Die Casting Forecast will be the start of a series of articles on mechanized finishing. In September, PMM's editors will give you a bird's eye view of mechanization in painting, plating, polishing, barrel finishing . . . and then will follow in subsequent issues with a series of detailed case studies with full technical information on equipment, materials, flow charts and procedures.

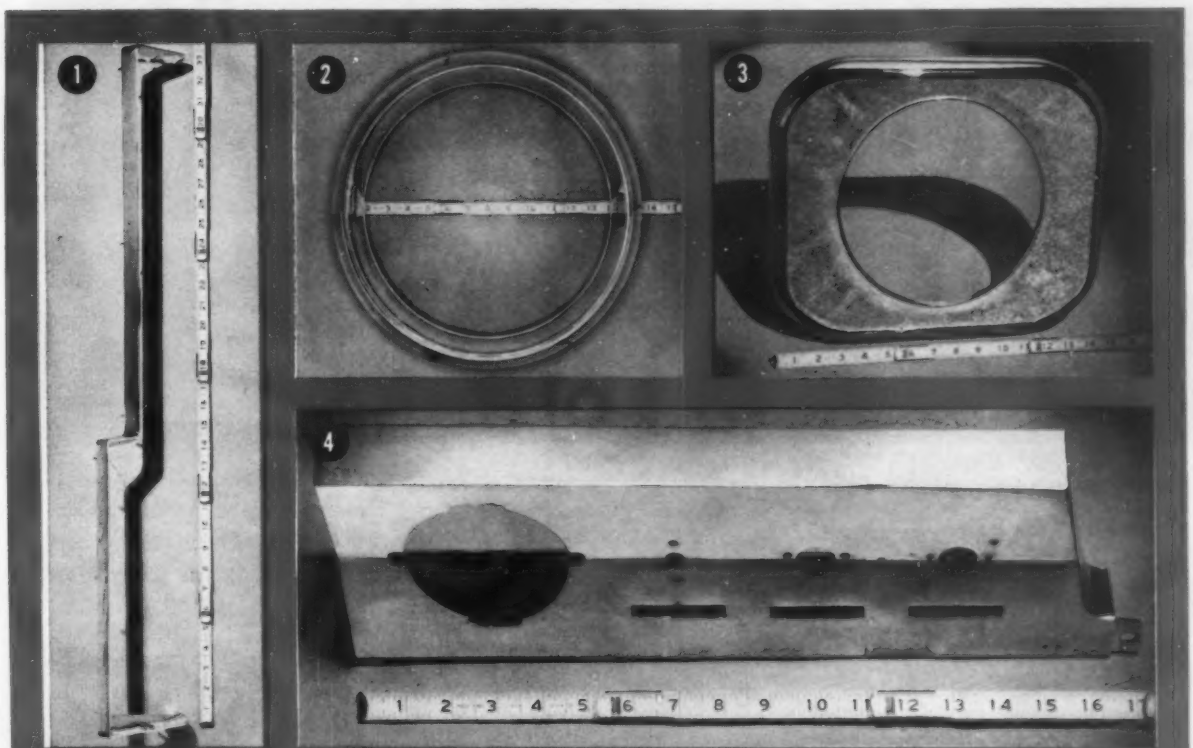
REED Vacucast Machine

BOOSTS PRODUCTION 32%—CUTS REJECTS BY 90%

These production figures are the improvements Lee Silver Service of Detroit, found in using its new Reed-Prentice Vacucast system. After 6 months of rugged, continuous zinc die-casting service, President Lee Radke cites the major advantages of his REED Vacucast:

- Surface quality of castings is greatly improved.
- Hardness and strength of castings are increased.
- Production is substantially increased.
- Ejection is extremely easy.
- An appreciable savings in metal is now possible due to a permissible decrease in wall thickness.
- Rejects are cut to less than 2%.

If you're producing zinc die castings, the exclusive REED Vacucast System can increase your production and your profits. For full details, write today to Reed-Prentice Corporation, 677 Cambridge Street, Worcester 4, Massachusetts.



1. The REED Vacucast raised production 32% and cut reject rate from 9% to 2% by overcoming difficulty of shooting metal to extreme ends of die. Ejection was easier, finish improved and castings less porous.

2. REED Vacucast eliminated webs and reduced size of gates and runners, cut total weight of shot by 4 lbs. Production was boosted from 97 to 131 parts an hour, and reject rate reduced from 15% to less than 2%.

3. Production on this appliance part was increased from 100 to 131 an hour, reject rate cut from 20% to under 2%. REED Vacucast improved casting skin and density so that higher heat could be applied for better paint-to-part bond.

4. This zinc appliance part could not be made successfully through straight die casting. Using the REED Vacucast, Lee Silver Service produces 135 parts an hour, with a reject rate well under 2%.

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Affiliate of PACKAGE MACHINERY COMPANY

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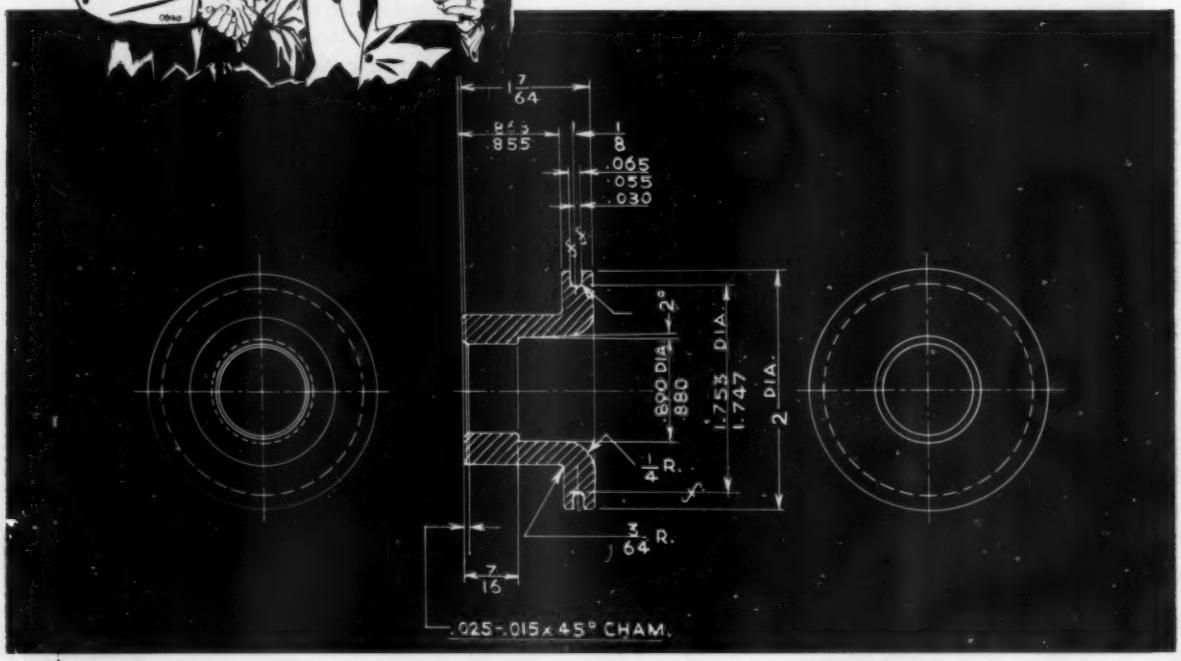
Hoeganaes Powders gave us 4-points of superiority - -



in metal parts like this, reports

COMPACTED METALS CORPORATION
North Chicago, Illinois

When discussing powdered metal precision parts like the above Spindle, Joseph W. Cepon of Compacted Metals Corporation, credits Hoeganaes with contributing to the top quality of the finished part. He puts it this way . . .

"The uniform density, compressibility, and particle size distribution of Hoeganaes Sponge Iron Powders gave us - -

1. Increased Tool Life.
2. Greater Dimensional Control.
3. Improved Sintered Strength.
4. Increased Production.

Hoeganaes Powders and Hoeganaes Technical Service could help to put the same 4-points of quality in *your* production program. The Hoeganaes Engineering Specialist would like to tell you how this is both practical and possible. He's as near as your phone. Why not give him a call today.

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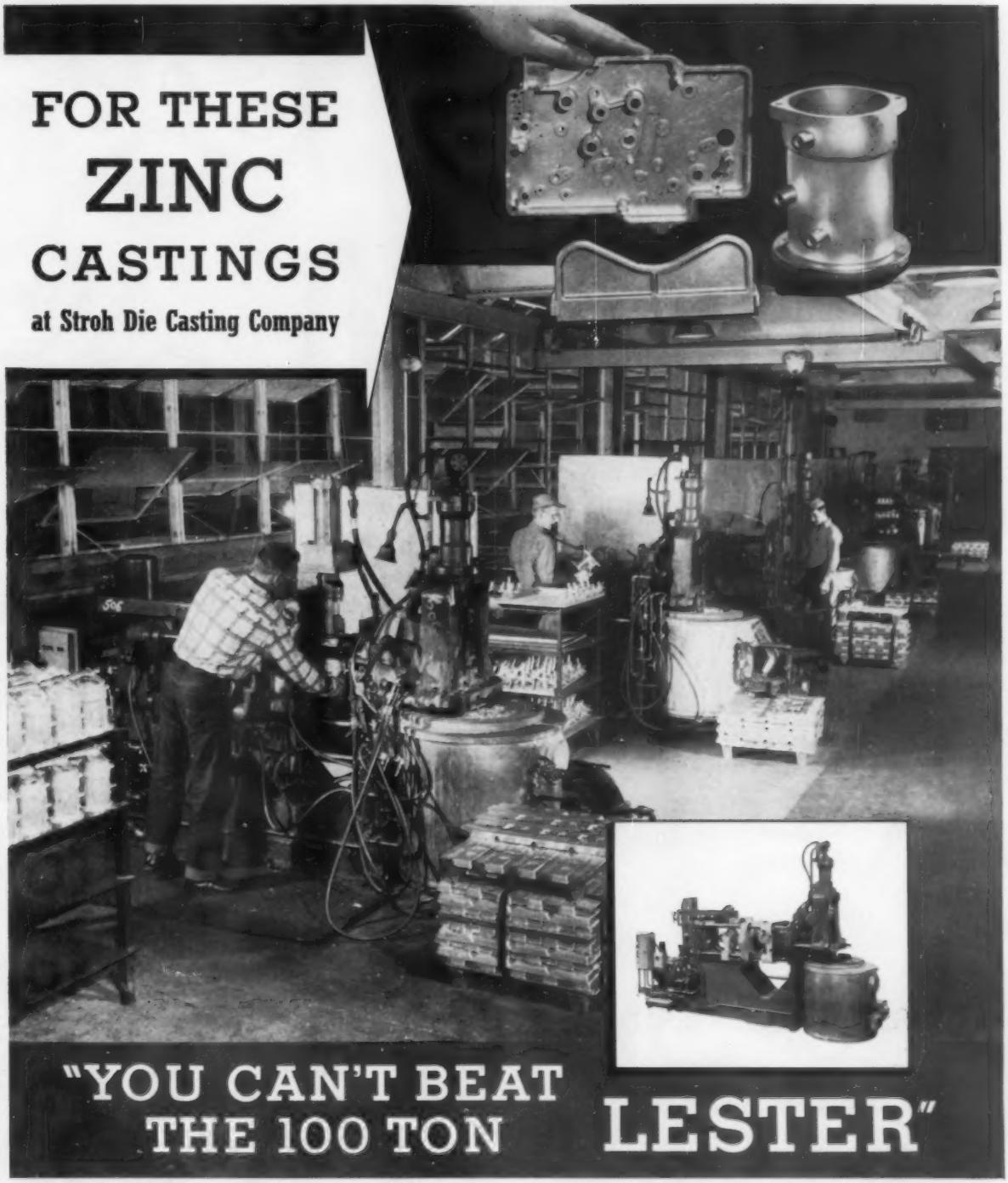
FOR THESE ZINC CASTINGS

at Stroh Die Casting Company



"YOU CAN'T BEAT THE 100 TON LESTER"

George Meier, General Manager of Stroh Die Casting Company, says:

> "For steady, dependable production on these die castings you can't beat the little 100 Ton Lester. Not only did we have a low initial investment, but maintenance costs have been surprisingly low during the entire eight years we've been using them."

The HHP-2-ZE includes among its features the famous Lester "one-adjustment" Zinc End and Central Die Height Adjustment. If you want to learn more about this rugged machine that can cast up to 6 pounds of zinc or make from 400 to 500 shots per hour, write today for Bulletin 101.

LESTER-PHOENIX, INC.
2711 CHURCH AVENUE • CLEVELAND 13, OHIO
Agents in principal cities throughout the world

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to assure good surfaces on shell-molded castings

Smooth castings that require a minimum of finishing are a major advantage of shell molding. Don't lose it through surface roughness that may cause otherwise sound castings to be rejected. Here are six ways to assure good surfaces on shell-molded castings:

1. Pour at the correct temperature. Usually, the lowest permissible pouring temperature results in the smoothest surface.

2. Check for poorly filled shells. Low density shells often cause roughness.

3. Avoid nozzle ingates. Increase ingate areas or choke the runner system.

4. Avoid metal inclusions. Keep runners full at all times, especially with drossing and high temperature alloys.

5. Position horizontally. This reduces metallostatic head, thus decreases tendency of metal to penetrate shell.

6. Check sintering point and grain size distribution of sand.

One thing more. Use a top-quality resin. G-E resins are preferred by many foundries for their good flow properties, fast cure, fine particle size and excellent release properties. Try them. And write today for a helpful brochure, "59 Answers to Your Shell Molding Problems". GENERAL ELECTRIC COMPANY, Section PM-4, Chemical Materials Department, Pittsfield, Mass.

Progress Is Our Most Important Product

GENERAL ELECTRIC

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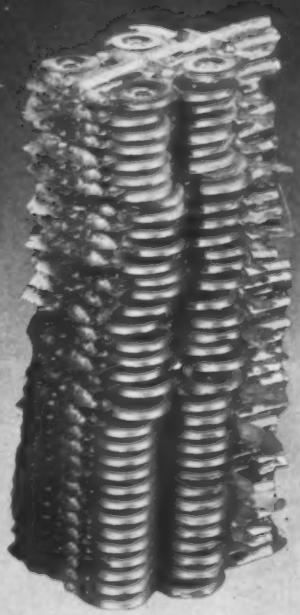
$5400 annual saving

by $4200 investment in ECLIPSE FURNACE

New Double-Chamber Dry-Hearth-Type Metal Melter Proves Flexibility in Small Shop



Increases Production . . . Eliminates Rejects

● The new Eclipse double-chamber dry-hearth-type metal melter—actually a new method—replaced two crucibles and one reverberatory furnace at Le Claire Manufacturing Co., Le Claire, Iowa, and has paid for itself at the rate of $450 a month in savings! The new melter combines advantages of Eclipse direct firing with the first truly separate melting and holding chambers. At Le Claire, the one dry-hearth melter has made this remarkable record supplying all metal for the plant's sand- and die-cast aluminum casting operations. Castings for power mowers, electric and gas motors, as well as many others, are cast from this one furnace. Actually designed for high-production operation, the melter gives even better results in larger foundries.

Pigs are melted on a steep sloping hearth which gives fast run-off of molten metal to the holding chamber. Gassing and agitation of the metal in holding chamber are eliminated because no cold metal enters the bath. Direct firing permits faster, more efficient heating, requires less fuel. All moisture is driven off while metal is melting . . . all oxide inclusions are deposited on surface of hearth where they are easily removed by raking. Hearth and holding chamber are separately heated and controlled for ideal melting and pouring temperatures. And there are more additional quality-improving and cost-saving advantages for your *large or small* operation than can even be suggested here! Write *today* for . . .

Bulletin C-80 →

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ECLIPSE FUEL ENGINEERING CO. OF CANADA, LTD., 20 UPJOHN ROAD, DON MILLS, ONTARIO

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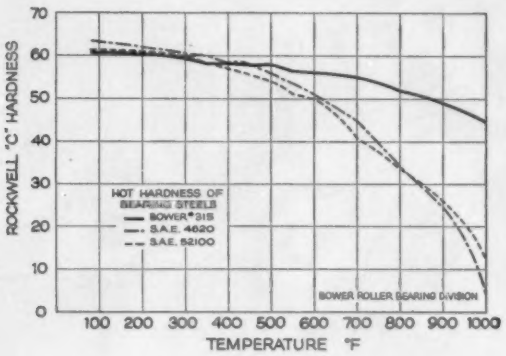
CASTING ABOUT

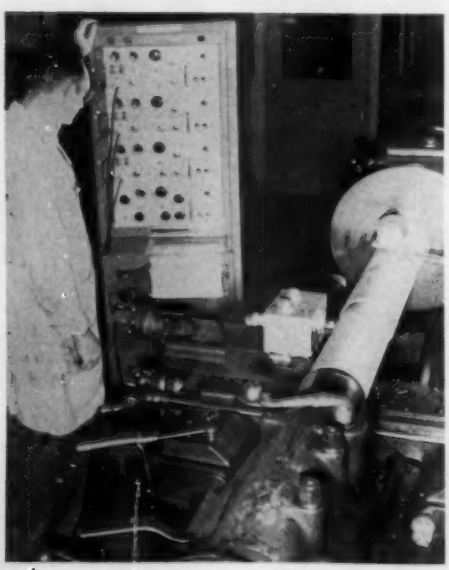
technical news of applications & processes involving precision metal moldings



"NATIVE" STEEL FOR HIGH TEMPERATURE BEARINGS now promises to sidestep materials shortages in case of national emergency. An alloy steel for jet engine bearings being produced by Republic Steel Corporation for the Bower Roller Bearing Division of Federal-Mogul-Bower, Inc.. uses 99% native alloying materials . . . 3 percent nickel, 1.5 percent chromium and 5% molybdenum. No imported components, such as tungsten or cobalt, are required. The new steel, identified as Bower 315, was the result of more than 100 experimental heats made for Bower at Republic's Alloy Steel Division in Massillon, Ohio. Key to its performance is the heat treatment covered by a Bower patent.

The new bearing steel is currently being used on the "hot" end of military jet engines at operating temperatures up to 500 F. . . . about twice those for bearings in internal combustion engines. While steel ordinarily softens permanently at elevated temperatures, the new alloy recovers its original hardness when cooled to room temperature after heating as high as 1000 F. Races and rollers for bearings are held at 1000 F as the final step in heat treatment.

CUTBACK IN ZINC PRODUCTION by a leading metals company as a result of drop of three cents a pound in the price of the metal during a two-month period was recently announced. American Smelting and Refining Company closed mines at Colville, Wash., Crested Butte, Colo., and Vanadium, N.M. The three mines produced approximately 3,000 tons of zinc per month. Total production of zinc by all U.S. mines has averaged about 45,000 tons per month during the first quarter of the year.



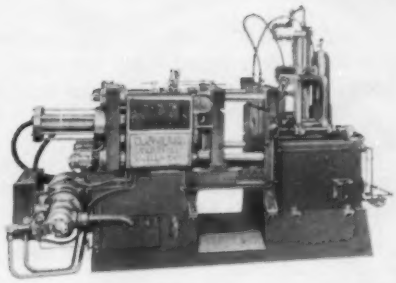
GETTING COBALT FROM "PROBLEM" ORES by the patented, non-smelting Sill method was expected to be in production by mid-Summer at the Newburgh, N.Y., plant of Metallurgical Resources, Inc. The process, which gets cobalt from ores having high content of arsenic and sulfur, is reported to assure an adequate supply of the metal in the event of emergency. United States used 75% of the world's cobalt supply, most of it imported. This will be the first commercial test of the process, developed by Dr. Harley A. Sill.

THREE COMPONENTS OF FORCE on a carbide cutting tool . . . under test on a lathe . . . are being measured in the photograph at the left. To do this, a four-channel electronic oscillograph is utilized in the machinability laboratory of General Electric's Metallurgical Products Department, Detroit. The recently acquired electronic unit, besides making force or strain analyses, also can be used to measure speed, temperature and machine tool horsepower.

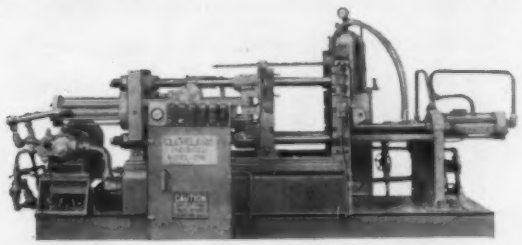
Continued on page 17

your answer to Profitable die casting production

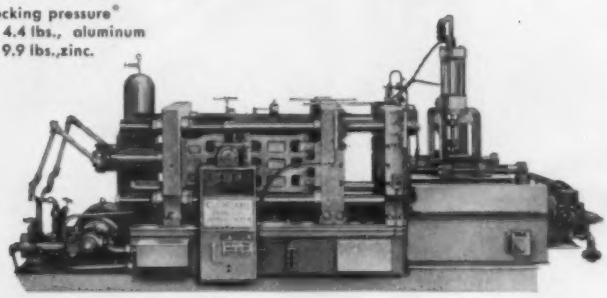
CLEVELANDS



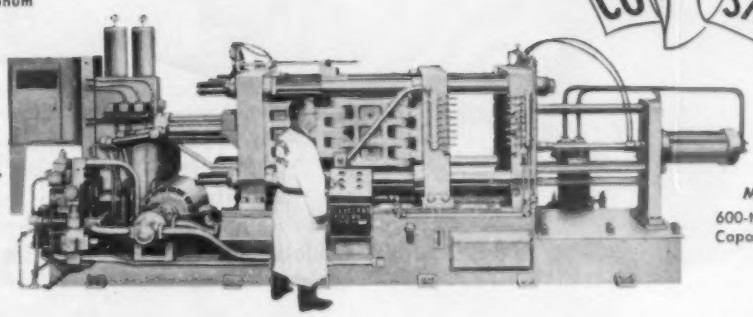
Model 50 Cleveland
50-ton locking pressure*
Capacity: 2.6 lbs., aluminum
5.4 lbs., zinc



Model 200 Cleveland
200-ton locking pressure*
Capacity: 4.4 lbs., aluminum
9.9 lbs.,zinc.



Model 400N Cleveland
400-ton locking pressure*
Capacity: 7.2 lbs., aluminum
14.5 lbs., zinc.



Model 600 Cleveland
600-ton locking pressure*
Capacity: 10 lbs., aluminum
25 lbs., zinc.

**Locking pressure strain gage tested.*

Shown here are several models in the line of Cleveland Universal Hydraulic Die Casting Machines...each one a champion in its class! Whether the casting size is large or small, there's a Cleveland that will fit your production requirements exactly and give you castings of precision quality at a highly profitable rate.

The nation's leading die casters rely on Clevelands for dependable performance. Find out now how Clevelands can improve your die casting production with money saved. Call in a Cleveland sales engineer. For complete machine specifications, write for bulletins.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

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New LINDBERG–FISHER Autoladle

Here, for the first time, is a ladling unit that makes automatic casting of aluminum not only possible but practical. The Autoladle has been thoroughly tested and proven in service.

"LITTLE JOE" provides these advantages:

- Adaptable to induction, electric resistance or fuel-fired reverberatory furnaces.
- Ladled metal is withdrawn from beneath surface of bath.
- Precise, accurate control of any size shot up to 30 lbs.
- No interruption of the casting cycle during charging of metal.
- No variation of size of shot due to metal level changes.
- Composed of special refractory materials so arranged that ladled metal cannot come in contact with any metal.

To the best of our knowledge this is the first practical automatic ladling unit yet devised. It will fill an important need in many casting operations. For complete information, get in touch with your nearest Lindberg Field Representative (see your classified phone book) or write direct.

LINDBERG FISHER MELTING FURNACES

A Division of Lindberg Engineering Company, 2463 West Hubbard Street, Chicago 12, Illinois

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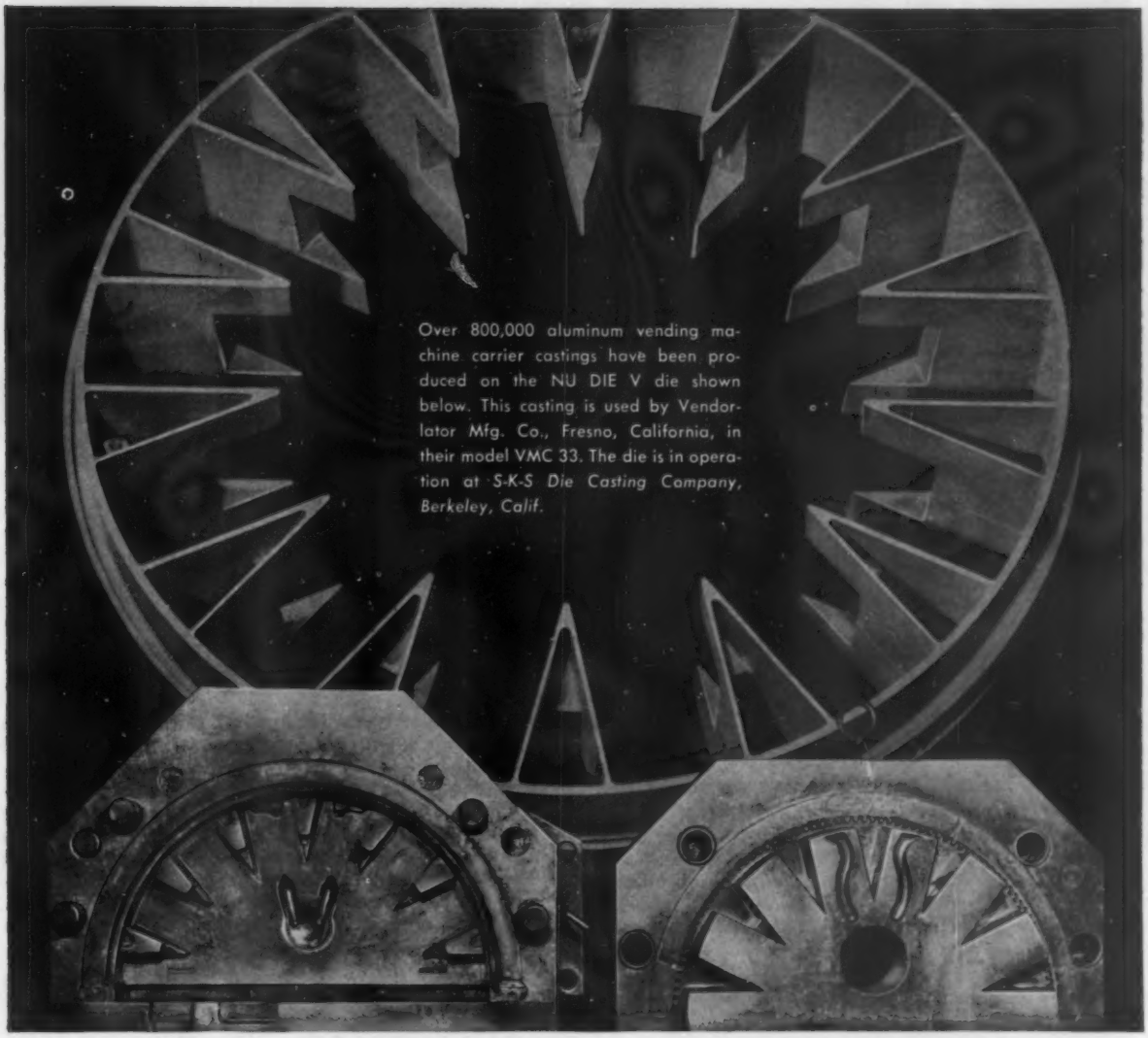


Over 800,000 aluminum vending machine carrier castings have been produced on the NU DIE V die shown below. This casting is used by Vendorlator Mfg. Co., Fresno, California, in their model VMC 33. The die is in operation at *S-K-S Die Casting Company, Berkeley, Calif.*

Die of Crucible NU DIE V still in service after 800,000 "shots"

The die shown above, made of Crucible NU DIE V die casting die steel, has been in operation 10,000 hours. It has produced over 800,000 "shots" with no special maintenance required. And the die is still in excellent condition.

Long, continued runs like this develop high die heat of 700/900 F but the NU DIE V die has shown a minimum of heat checking, and is still giving dependable service. One good reason is that Crucible NU DIE V is made to die casting steel quality. And each piece is ultrasonically inspected.

Crucible NU DIE V, as well as CSM_2 for zinc die casting and holder blocks for aluminum, are available from local warehouse stocks — in 438 sizes — 1″ to 40″ wide, ¾″ to 15″ thick. When you want quality die steels fast, call Crucible. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

For more information circle No. 19 on the Reader Service Card

Mineral oil hydraulic fluid instantly ignites upon torch flame contact

Fire resistance plus low cost

FOR MANY YEARS frequent industrial fires involving hydraulic fluids have taken their toll in man-hours and high costs. This has created a widespread need for a relatively inexpensive all-purpose, fire-resistant hydraulic fluid.

In undertaking this challenge, Shell Research Laboratories spent over four years in laboratory and field testing before a solution was reached. The result was the introduction of Irus* Fluid 902 . . . the first low-cost, oil-base fluid that, under plant conditions, actually snuffs out fire.

The new formulation is a specific combination of petroleum oils mixed with water and emulsifying agents. It gains its fire resistance through a relatively high water content. Irus Fluid is perfectly adapted to the majority of hydraulic systems. The following is typical of many reports in Shell files.

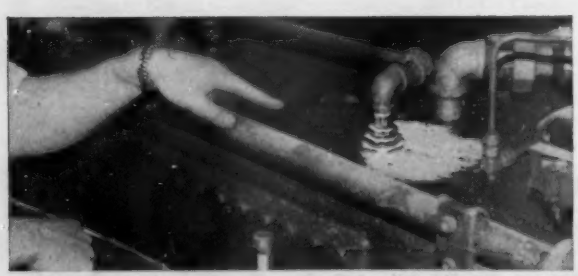
Typical Problem and Solution

The welding plant of a prominent automotive manufacturer employing 100 hydraulically operated electric welders formerly used a straight mineral oil fluid. On one occasion, damaged fluid lines allowed this mineral oil under high pressure to spray directly onto the welding area. Sparks ignited the fluid . . . caused an immediate flash fire which resulted in 75% machinery damage before it was extinguished. Immediately following this incident, the changeover was made to Shell Irus Fluid 902. Shortly thereafter a line broke and the high-pressure spray once more contacted welding sparks. There was no fire at all . . . and in a matter of minutes the machinery was operating at full efficiency.

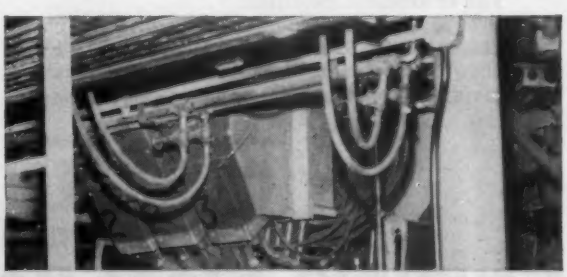
The two photos above provide dramatic proof of its flame resistance. In the photo on the left, conventional hydraulic fluid instantly ignites upon contact with an oxy-acetylene torch flame, whereas Shell Irus Fluid 902 (right photo), under the same conditions, does not support combustion beyond an inch or two from the flame. *Under plant conditions, it actually snuffs out fire!*

Two-Way Economy

An advantage not to be overlooked is the low cost of Irus Fluid 902. Many plant operators now making the



A leak is quickly spotted because of Irus Fluid's distinctive yellow color.



The complexity of cable lines necessitates the use of a fire-resistant hydraulic fluid to eliminate fire hazard.

Under the same conditions, Shell Irus Fluid 902 clearly demonstrates its fire resistance

in a new hydraulic fluid

switch to Irus Fluid find that it costs up to one-third less than other fire-resistant fluids—and its performance is comparable in every practical respect. This money-saving advantage is a vital consideration not only in the initial purchase price, but in reducing make-up loss expense.

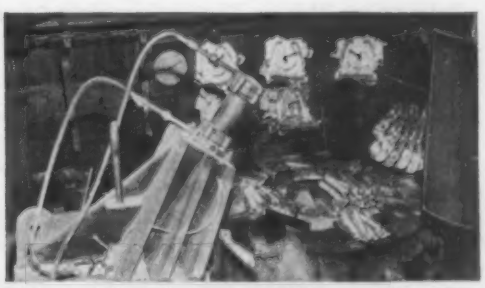
Irus Fluid 902 has other features, too:

1. **It contains no corrosive ingredients and has shown no harmful effects on normal seals, fittings, or bearings . . . it will not promote rust.**
2. **No major equipment modification is necessary . . . simply clean your present fluid thoroughly from the system and replace with Irus Fluid.**
3. **Practical application proves it has exceptional viscosity and lubricating qualities . . . doesn't thin out in use.**
4. **The yellow color of Irus Fluid enables you to spot and trace leaks easily . . . a valuable benefit in preventive maintenance.**

If your operation utilizes die-casting machines, plastic molding machines, glass blowing machines, permanent mold machines or any other hydraulic equipment where fire hazards are of concern, we suggest you investigate the advantages of Shell Irus Fluid 902.

Write or call the Shell Oil Company office nearest you.

*Trademark



Such specialized die-casting machines require a fire-resistant hydraulic fluid to assure maximum safety.

Finger points to line break in hydraulic cable that caused flash fire and machinery damage while operating with mineral oil type fluid.

SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL

For more information circle No. 48 on the Reader Service Card

These parts are IMMUNE TO MOLTEN ALUMINUM

Molten aluminum can't wet, can't harm the precision-formed parts shown here. These parts and fittings for aluminum die-casting and direct-chill castings are all made of REFRAX® silicon-nitride-bonded silicon carbide. They are Carborundum's answer to the need for a material that can be formed into intricate parts with outstanding corrosion resistance far above normal melting temperatures. REFRAX shapes are solving many problems in aluminum holding furnaces and aluminum alloying furnaces (including reverberatory and induction).

Consider the value of these other properties in your operation: Tolerances of ± .0005 in./in.; a modulus of rupture of 5600 psi at 2450°F (even the best heat resistant alloy melts below this temperature); and high heat conductivity that approaches that of chrome-nickel steel. Write today for product bulletin and technical articles on REFRAX materials. ***Refractories Division, The Carborundum Company, Perth Amboy, New Jersey, Dept. W87.***

CARBORUNDUM
Registered Trade Mark

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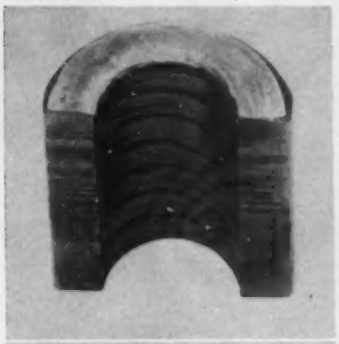
CASTING ABOUT

continued from page 10

SOLID VS SINTERED BRONZE was given a severe testing recently by a major manufacturer of hospital beds and equipment. A vital part of the elevating mechanism is a simple feed nut. To conduct the test, one hospital bed was equipped with a solid bronze nut; an identical bed was equipped with an Oilite sintered bronze nut made by Amplex Division of Chrysler Corp.



After 2,223 raising and lowering cycles, the acme threads on the solid bronze nut were worn so smooth that the nut would no longer function; after more than 44,000 cycles, the threads of the sintered nut shows no apparent wear and the nut still retained its self-lubricating qualities. Other favorable features include: good machinability and low cost.

ULTRA-HIGH-STRENGTH STEEL that can be heat-treated to 285,000 psi with sufficient ductility for structural applications has been produced experimentally by the National Bureau of Standards. The steel is made by normal melting and working processes and should not be difficult to manufacture. Primarily slated for aircraft landing gear, the steel is said to be not only strong but also to have high impact resistance.

YOUR GUIDE TO BETTER DIE CASTINGS

—How to design for CHROME-PLATED DIE CASTINGS

Chromium plating of zinc die castings is often the ideal solution for improved appearance and superior resistance to corrosion and wear. Chromium is applied on top of copper plus nickel, depending on the coating thickness required and the need for corrosion resistance.

Plating Thickness: Type of service determines thickness of plating. Thinnest coatings for decorative plating, heavy deposits for wear resistance. Copper undercoating should be at least 0.00020 in.; nickel a minimum of 0.00050 for outdoor service and 0.00030 for all other service. Minimum chromium thickness should be 0.000010 in. Specify heavier coatings for severe corrosive or abrasive service.

Part Preparation: For effective durable chromium plating, parts should be free of sponginess, die markings, casting defects such as cold shuts and pinholes. Die casting based on sound design will lower costs for preparation of parts for plating.

Section Thickness: Heavy sections, thick pads or bosses can cause surface shrinks that may impair the plated finish or add to preparation cost. Thin uniform sections are better, provided thickness is heavy enough to insure smooth, even surface. Minimum wall thicknesses for zinc—0.030 in. average, 0.060 in. for larger parts; for aluminum —0.050 in. and 0.080 in.

Surfaces: Large, flat surfaces exaggerate small imperfections—some degree of crowning aids good die casting and results in better appearance. Introducing a slight pattern, raised beads, shallow ribbing or other serrated design is desirable where they will not interfere with casting and buffing.

Fillets and Corners: Generous radii and fillets should be used where possible. Rounded surfaces can be cast stronger and are easier to clean, buff and finish. Avoid sharp edges and projections. Sharp inside corners are difficult to polish. Small fillets at strengthening ribs promote good plating. Minimum fillet size—0.060 in.; outside radii not less than 0.015 in.

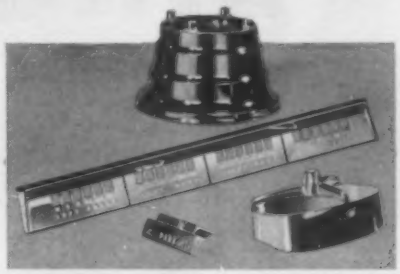


Fig. 1 — Thin walls obtained by coring out heavy sections give sounder surfaces as a base for plating.

Fig. 2 — Even a slight "crowning" of flat surfaces improves appearance, facilitates polishing and plating, and cuts down rejection rate.

Parting Lines: Consider flash removal when designing parting lines. Minor design changes in the part may avoid special trimming equipment. Transferring parting lines from one surface to another can simplify trimming, buffing and finishing. Beading the parting line will reduce finishing costs by simplifying flash removal—and can also serve to blend slight mismatching of parts.

Other Decorative Platings: Brass may be substituted for chromium on the last stage of the plating process. Silver, gold or other metals can be plated on zinc after pre-plating with copper and nickel. Black coatings can be produced on zinc by electrochemical methods.

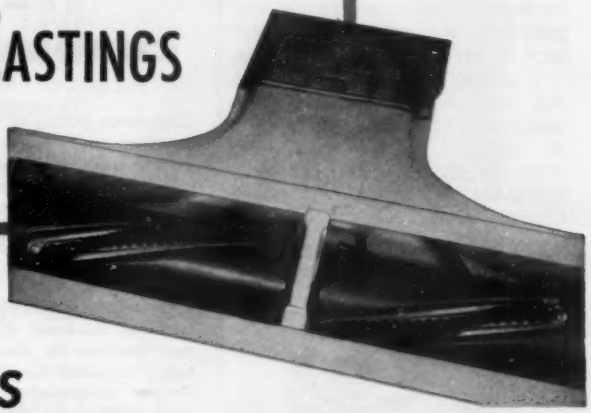
Let Precision engineers show you many economical ways to die-cast and plate durable, attractive products.

PRECISION CASTINGS CO.
DIVISION OF HARSCO CORPORATION

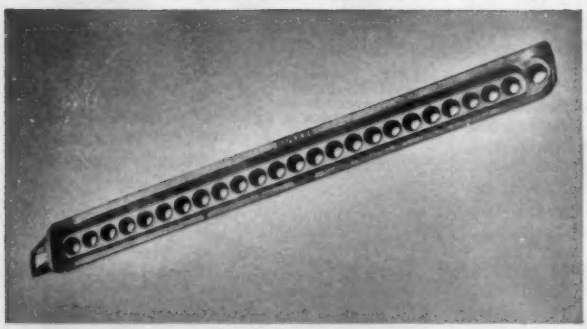
Central Sales Office: Fayetteville, N. Y.
Fayetteville, N. Y. — Syracuse, N. Y. — Cortland, N. Y. — Chicago, Ill.
Cleveland, Ohio — Kalamazoo, Mich. — Detroit, Mich. — Rockford, Ill.

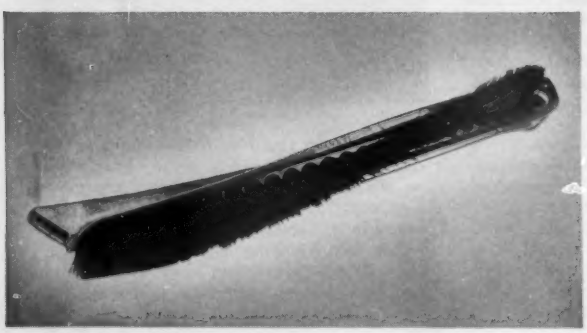
For more information circle No. 45 on the Reader Service Card

There's a Good Reason why **ZINC** DIE CASTINGS are so widely used



...at HOOVER ...IT'S **DUCTILITY**





The straight die casting (at top) is put into production without any machining. The bristles are fastened in place and the forming operation twists the bar to the proper curvature for installation on the agitator.

Design engineers at The Hoover Company found that DUCTILITY provided the necessary answer to their problem of using ZINC Die Castings in the agitator of the upright electric vacuum cleaner.

Because of the helical contour of the brush, the metal back could not be die cast to the required shape since the anchoring holes for the bristles would not be parallel to the motion of the die. The problem was neatly solved by a die caster who knew how to use the exceptional qualities of ZINC Die Castings.

The brush backs were cast straight, the bristles anchored in the holes and the castings were then cold formed approximately 115° to give the necessary helical contour. Even with the extra forming operation, die casting proved to be the most economical method of production since no machining was necessary.

Ductility is just one of the many physical and mechanical advantages that make ZINC Die Castings so widely used by manufacturers who want the best product with lowest costs of parts and assemblies.

ZINC
FOR DIE CASTING ALLOYS

THE NEW JERSEY ZINC COMPANY *160 Front Street, New York 38, N. Y.*

The research was done and the Zamak die casting alloys were developed with

HORSE HEAD SPECIAL (99.99 + % Uniform Quality) ZINC

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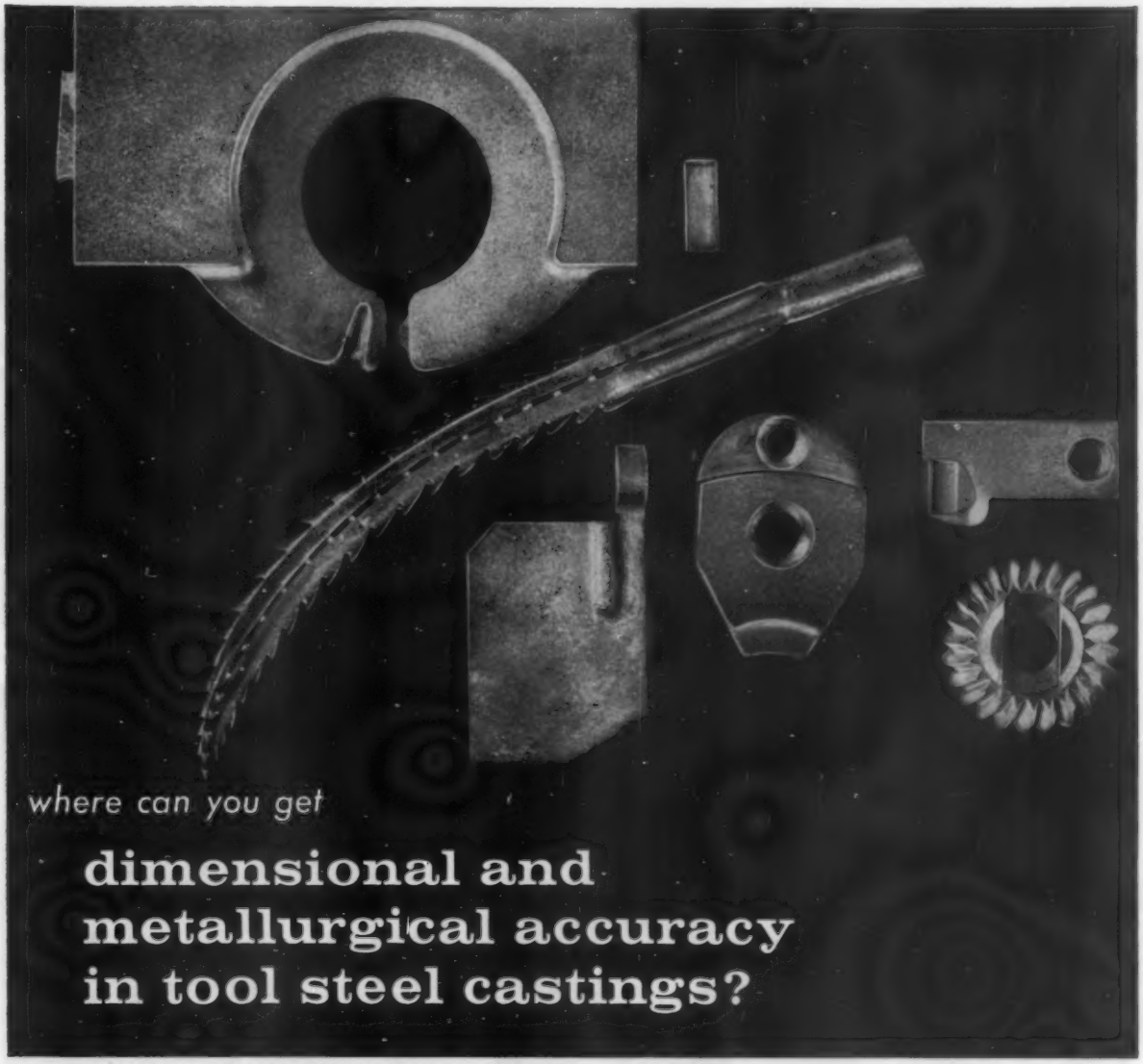

where can you get

dimensional and metallurgical accuracy in tool steel castings?

The quality of tool steel castings depends heavily on metallurgical control and foundry techniques which can be acquired only through long experience in handling tool steels. That's why it will pay you to get your castings directly from Crucible, largest and leading producer of tool steels.

Only Crucible can furnish precision castings in Ketos, Rexalloy, Rex M-2, Rex AA, Airkool, HYCC and Airdi 150—tool steels that solve wear, abrasion and temperature problems when ordinary alloys fail.

Crucible Accumet® Precision Investment Tool Steel Castings are regularly produced with a tolerance of ±.005″ (and even ±.002″ or ±.003″) and a surface finish of 125 RMS to 62 RMS . . . and in almost any shape or configuration.

Uniformity in response to heat treatment. Crucible quality control, from heat to heat, and complete inspection facilities ensure the uniformity in hardenability so necessary for successful tool steel castings.

Crucible Accumet Tool Steel Castings can help you reduce costs and improve product performance. Consider Crucible's extensive facilities and experience when you need either investment or sand castings. Write for free booklet to: *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pennsylvania.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

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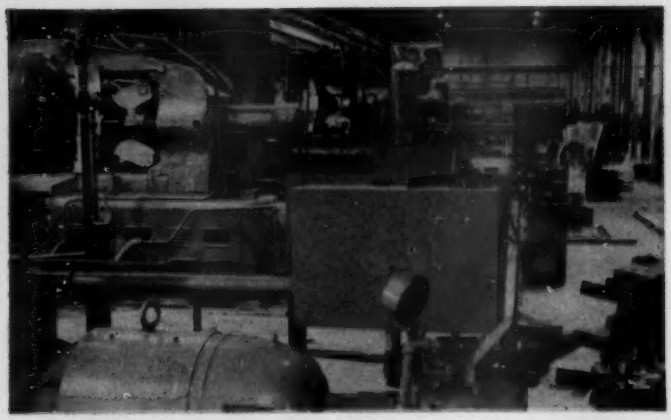
NOW! 3-SHIFT OPERATION GIVES YOU

Pictures show how big, new Bendix foundry uses modern equipment and continuous shifts to provide on-time delivery.



40,000 SQUARE FEET—All new and devoted exclusively to aluminum and magnesium die-casting.

THE MOST ADVANCED EQUIPMENT—Including automatic ladling and handling ready to work *for you.*

24-HOUR OPERATION—Continuous shifts give you what you want when you want it.

EVERY CASTING METHOD FOR ALUMINUM AND MAGNESIUM is available at Bendix Foundries. Result: You always get the best method for *your* particular job. At Bendix you'll find one of the most completely equipped foundries in the country. The 175,000 square feet of versatile facilities include those for die, sand, centrifugal and shell, plaster and permanent mold. (That's why we can recommend without prejudice the best method for your job.) Whatever your needs—in castings or advice—phone, wire, or write BENDIX FOUNDRIES, TETERBORO, N. J.

West Coast Offices: 117 E. Providencia Ave., Burbank, California.
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Bendix
AVIATION CORPORATION

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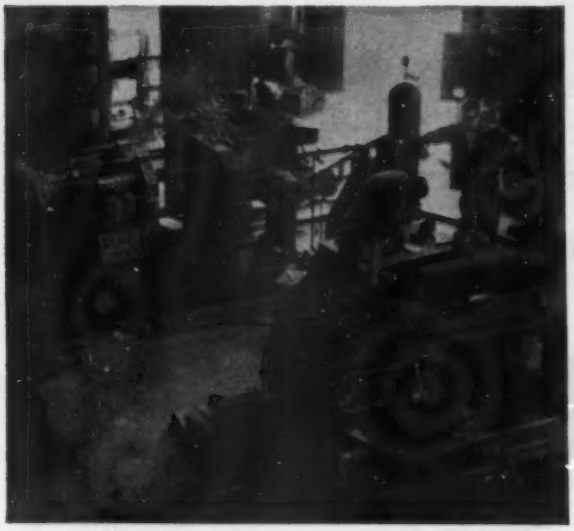
TOP-QUALITY BENDIX DIE-CASTINGS FAST

27 YEARS' EXPERIENCE in meeting highest quality standards of military and commercial users—at *your* service.



CASTING COSTS CUT many ways. For example, let us tell you how we gang unit dies on production jobs to save you money on small runs.

FREE!

A 24-page booklet, *Bendix Foundries*, describes in detail the advantages now available to you with magnesium and aluminum castings made in our big, new plant. Write for your copy today.

(clip now)

Bendix Foundries
Division of Bendix Aviation Corporation
Teterboro, New Jersey

Send me your free booklet, *Bendix Foundries*, by return mail.

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TITLE AND COMPANY_____

STREET_____

CITY AND ZONE_____ STATE_____

HIGHEST STRENGTH with MODERATE CONDUCTIVITY

BRUSH Alloys 250-C and 200-C can be hardened to the strength of steel (155,000 to 180,000 psi Tensile) by simple heat treatment, while maintaining 20% to 25% of the thermal and electrical conductivity of pure copper. USEFUL FOR: molds, bearings, gears, cams, valves, pumps, plungers, drawing dies, flash welder dies and other high strength and wear resistant parts.

250-C
Be . . 2.60-2.85%
Co . . 0.35-0.65%
Cu . . balance

200-C
Be . . 2.00-2.25%
Co . . 0.35-0.65%
Cu . . balance

HIGH CONDUCTIVITY with HIGH STRENGTH

BRUSH Alloys 55-C and 35-C are specified where highest thermal and electrical conductivity are required. By combining 45% to 50% of copper's conductivity with high strength (95,000 to 120,000 psi Tensile), these alloys find application in: switch and circuit breaker contacts, welding electrodes, slip rings and contact arms, and parts in which conductivity and strength at elevated temperature are vital.

35-C
Be . . 0.25-0.50%
Ni . . 1.40-1.60%
Cu . . balance

55-C
Be . . 0.55-0.75%
Co . . 2.40-2.60%
Cu . . balance

Brush Beryllium

BERYLLIUM COPPER CASTING ALLOYS
BeCu

BERYLLIUM METAL
BERYLLIUM COPPER
BERYLLIUM MASTER ALLOYS
BERYLLIUM OXIDE

THE BRUSH BERYLLIUM COMPANY, 4301 PERKINS AVE., CLEVELAND 3, OHIO

For more information circle No. 71 on the Reader Service Card

PMM LETTERS

the readers' forum

MAGNETIC MATERIALS

I have been referred to PRECISION METAL MOLDING as a source of answers to some of the questions I have regarding sintered metals. I am interested in a sintered metal for a D. C. application as a pole piece for a permanent magnet assembly. This is to be used in an indicating instrument. The material must have the following electrical characteristics:

1. Operate at medium or low inductions, where the material must magnetize and demagnetize without difficulty (4000 gauss).
2. High permeability.
3. High saturation induction value.

Can you refer me to any article you may have published with respect to the above electrical and magnetic characteristics? I am interested in possible sources of supply of the pole piece in the New England area.—P.B., project engineer.

No specific articles have been published in the area reader P.B. has inquired about. We have, however, furnished him with a directory of the powder metal industry (April 1957, PMM) with the suggestion that he take his problem directly to some of the parts manufacturers listed.—Ed.

POROUS METAL

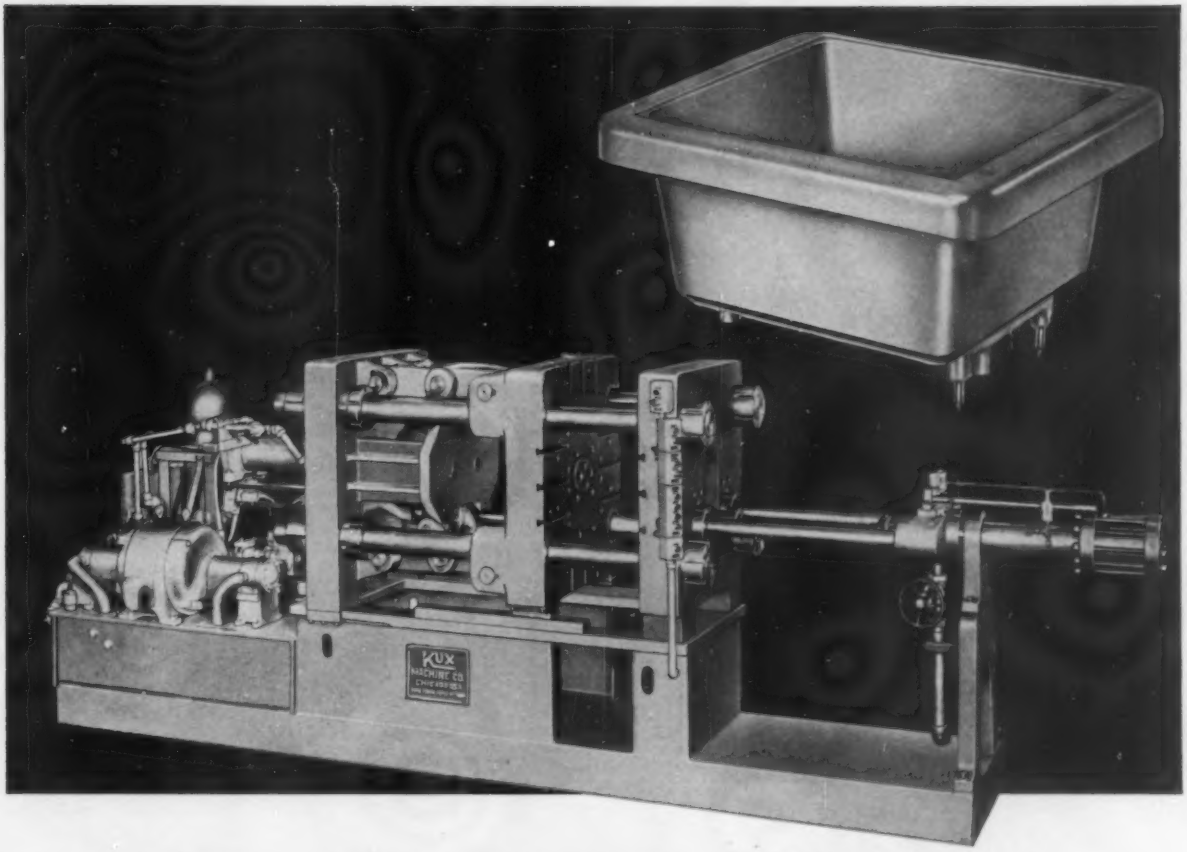
On page 12, June, 1957 issue of your publication, reference is made to a porous sheet metal available for aeronautical purposes. We would appreciate receiving more detailed information on this material.—H.G.D., materials and processes engineer.

The material referred to is the new porous sheet material developed by Armour Research Foundation of the Illinois Institute of Technology by the fibre metallurgy process. Information concerning this material can be secured from Armour.—Ed.

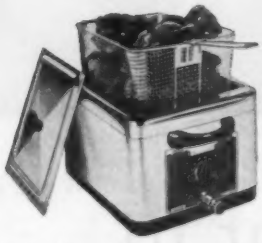
PLASTER MOLD CASTING

Will you please send information about the plaster mold casting process. The materials used in making the molds, where to get it, how to keep it from stick-

Continued on page 25



to get hardware finish quality castings with cast-in heating elements **EASTERN METAL PRODUCTS** *chose...*



KUX DIE CASTING MACHINES

for the Alcamatic Cooker and Deep Fry

"The die-cast well is the heart of our ALCAMATIC Cooker and Deep Fry and naturally must be of top-quality construction," says Mr. Seymour Troy, executive vice-president of Eastern Metal Products Corp., Tuckahoe, N.Y.

"The use of KUX machines (3 in the Forth Smith, Ark., plant and 4 in our Tuckahoe factory), plus our own production processing, enables us to provide the finest aluminum well, making the product an excellent working unit as well as an attractive appliance.

"KUX machines make the difficult problem of cast-in Calrod heating elements easy," Mr. Troy says, "plus cutting our production costs considerably.

"The hardware finish quality castings provided by KUX machines eliminates many polishing and finishing operations and leaves the fry well easy for the housewife to clean."

For the manufacture of electrical appliances requiring dense hardware finish quality castings, KUX die casting machines are unexcelled. Write for our NEW illustrated catalog.

MODEL HP-37 ILLUSTRATED

Hydraulically operated die casting machine for production of aluminum castings.

KUX MACHINE CO. 6725 NORTH RIDGE AVENUE • CHICAGO 26, ILLINOIS

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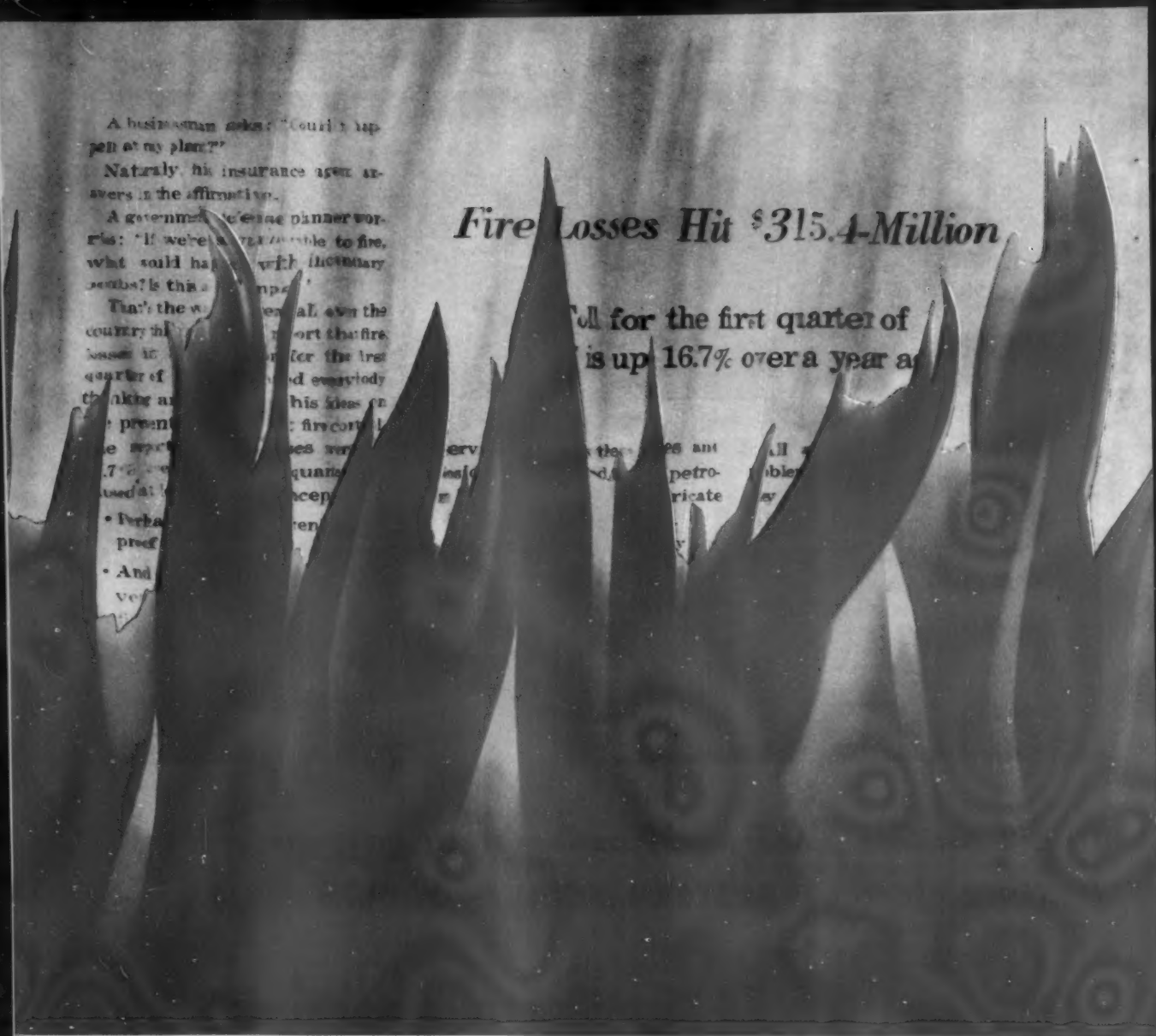


Plan against it . . . not for it!

Cellulube fire-resistant hydraulic fluids and synthetic lubricants open up new areas of in-plant fire prevention

The stakes are high—personnel, equipment, production, reputation. No one has better reasons than industry has to plan against fire.

And with today's advances in chemistry, industry has never had more effective and specialized materials with which to do just that.

Cellulube fire-resistant hydraulic fluids and synthetic lubricants are good examples. In hydraulic equipment, they reduce the danger of uncontrollable fire caused by line breaks or other failures when flammable fluids are in use. In air compressors, these non-petroleum oils not only prevent excessive carbon formations—the main source of fire and violent explosion—but also meet the severest of lubrication requirements.

Minimizing the hazards of industrial operations through development of fire-resistant Cellulubes . . . making these functional fluids available in 6 controlled viscosities for broader application . . . this is another example of Celanese research and product development at work hand-in-hand with industry.

Celanese Corporation of America, Chemical Division, Dept. 589-H, 180 Madison Avenue, New York 16.

Celanese® Cellulube®

Basic reasons . . . . . for improved products

Acids	Functional Fluids	Polyols
Alcohols	Gasoline Additives	Plasticizers
Aldehydes	Glycols	Salts
Anhydrides	Ketones	Solvents
Esters	Oxides	Vinyl Monomers

Celanese CHEMICALS

Agricultural	Paper
Automotive	Pharmaceutical
Aviation	Plastics
Building	Surface Coatings
Electrical	Textiles

LETTERS

continued from page 22

ing to patterns and other technical information necessary for using this process.

Would you know of any books or literature giving this information.—W.E.P.

The names and addresses of suppliers to this industry have been sent to reader W.E.P. The source companies have manuals giving full information on procedures, materials, etc.—Ed.

SMALL CASTING FIELD

I have been told that you can possibly furnish us with some information we need. We would like to have a breakdown of the pounds of aluminum and zinc die castings by size. In other words, how many pounds of castings less than 2 lbs. each are produced, between 2 lbs. and 10 lbs., etc.? We are mostly interested in the lower values of pounds per casting.

We would also like to know whether the field of small castings is supplied by a different group of people; in other words, something about the nature of a small die casting.—H.E.W. research and engineering div.

We also would like to have some of the answers. While we have figures on industry totals by alloys, there are no statistics available on the quantities of castings by size. During the past several years there has been a trend toward specialization in the die casting field. Certain producers do make a specialty of producing small die castings. However, most foundries still produce a full range of sizes.—Ed.

ADDRESS PLEASE

In your June issue of PRECISION METAL MOLDING, there appears an article starting on page 51, entitled "Ball Burnishing in a Barrel." On this page, the article advises that this type of finishing has been perfected by the Roll Brite Corp. of White Plains, N. Y. We wrote this company at White Plains, and our correspondence has been returned marked "Insufficient Address."

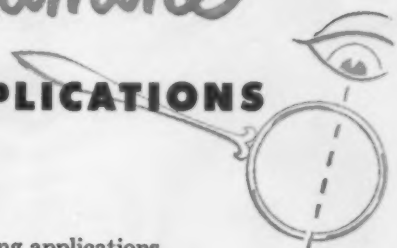
Will you be kind enough to give us the complete address of the Roll Brite Corp.—M.L.S., factory manager.

The complete address of the Roll Brite Corp. has been sent to reader M.L.S.—Ed.

Continued on page 68

time to re-examine

BEARING APPLICATIONS



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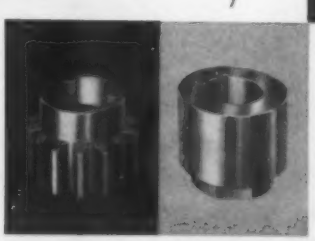

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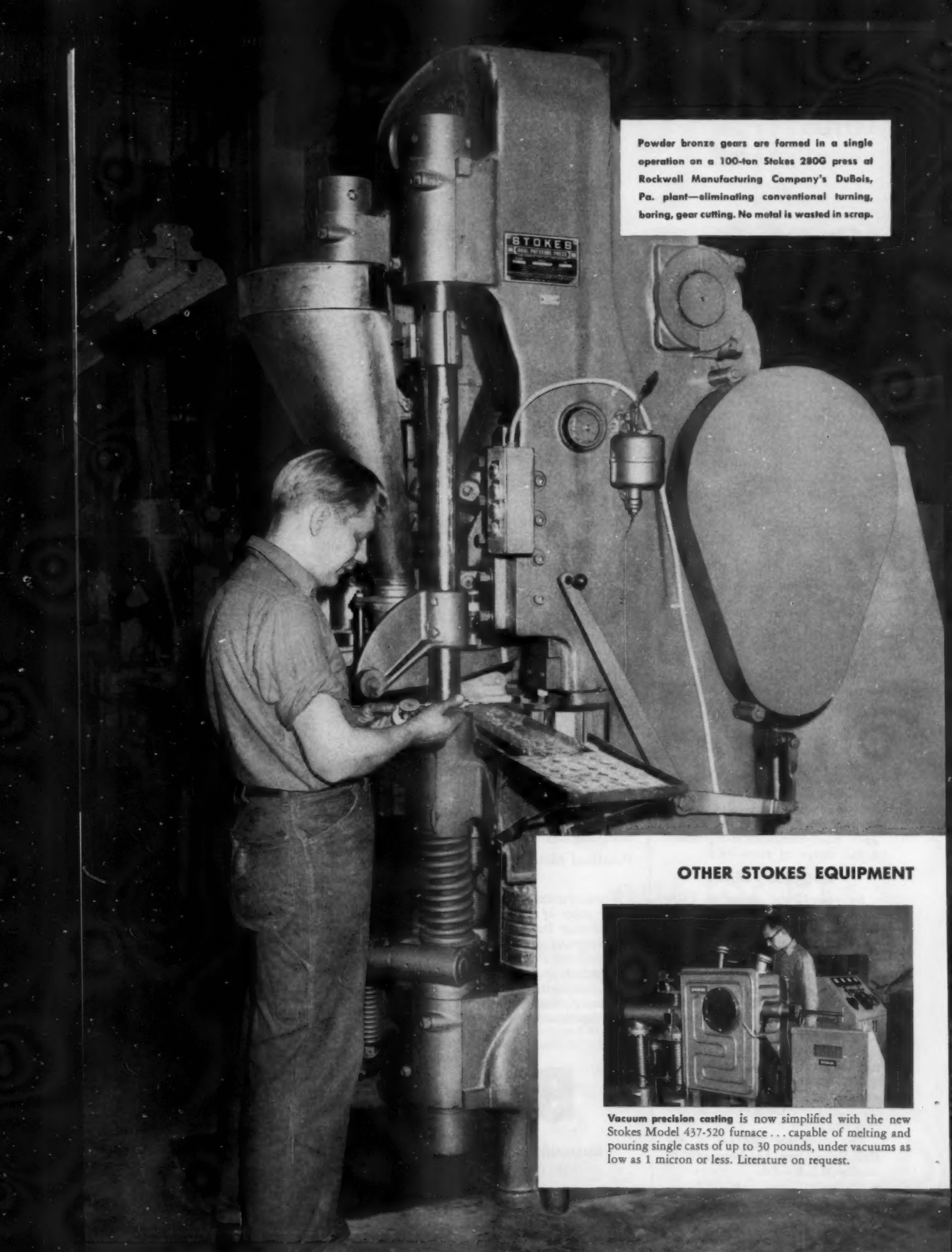

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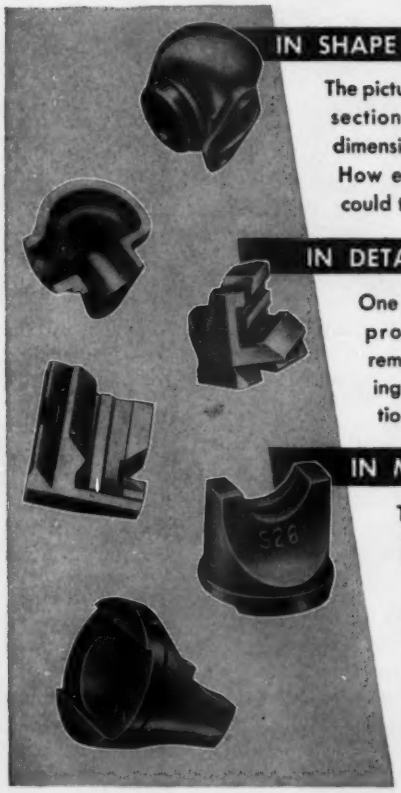

IN SHAPE

The picture tells the story . . . from the cross section it can be seen that the inside dimensions are greater than the holes. How else but by Investment Casting could this be made in one piece?

IN DETAIL REPRODUCTION

One look quickly shows the machining problems — most of them stock removal. By using an Investment Casting 21 out of 45 machining operations were eliminated.

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These are a few examples demonstrating that the function of the part is the first consideration in design — and — the Investment Casting process was the economical answer.

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PMM BOOKS

HIGH PRESSURE TECHNOLOGY, By Edward W. Comings, McGraw-Hill Book Co., Inc., New York, N.Y. Price $11.50

This is the first technical book to cover the whole field of high pressure technology. The central theme is the influence of elevated pressure on chemical and physical systems, and on the design of equipment for handling these systems experimentally or on a commercial scale.

Chapters deal with an introduction to the principles governing the properties of metals; with procedures and suggestions for safety practices; with principles of design of high pressure equipment; with stresses and strains in thick-walled cylinders and design limitations; etc.

The author presents both the theory and the art of applying high pressure in the laboratory and in industrial chemical processes.

MANUFACTURING METHODS AND PROCESSES, By Arthur C. Ansley, Chilton Company Publishers; Philadelphia, Pa. Price $12.50

The latest developments in manufacturing methods and processes are presented in a book designed for the executive, the purchasing agent, or the design engineer. Illustrated with over 450 illustrations, this non-technical book places its principle emphasis on the type of parts made by each process, their chief applications, and cost. Special attention is given to powder metallurgy and investment casting as well as other new developments.

A must for those who have little time but must keep up on the latest developments in production methods in an industry related, directly or indirectly, to the manufacture or distribution of mechanical products.

APPLIED METALLURGY FOR ENGINEERS, By Malcolm S. Burton, McGraw-Hill Book Co., Inc., New York, N.Y. Price $7.50

Although written as a text for survey courses in metallurgy, the book is applicable to all branches of engineering. Its purpose is twofold: 1) to develop the metallurgical principles involved in casting, metal working, welding, heat treatment, and powder met-

Continued on page 70

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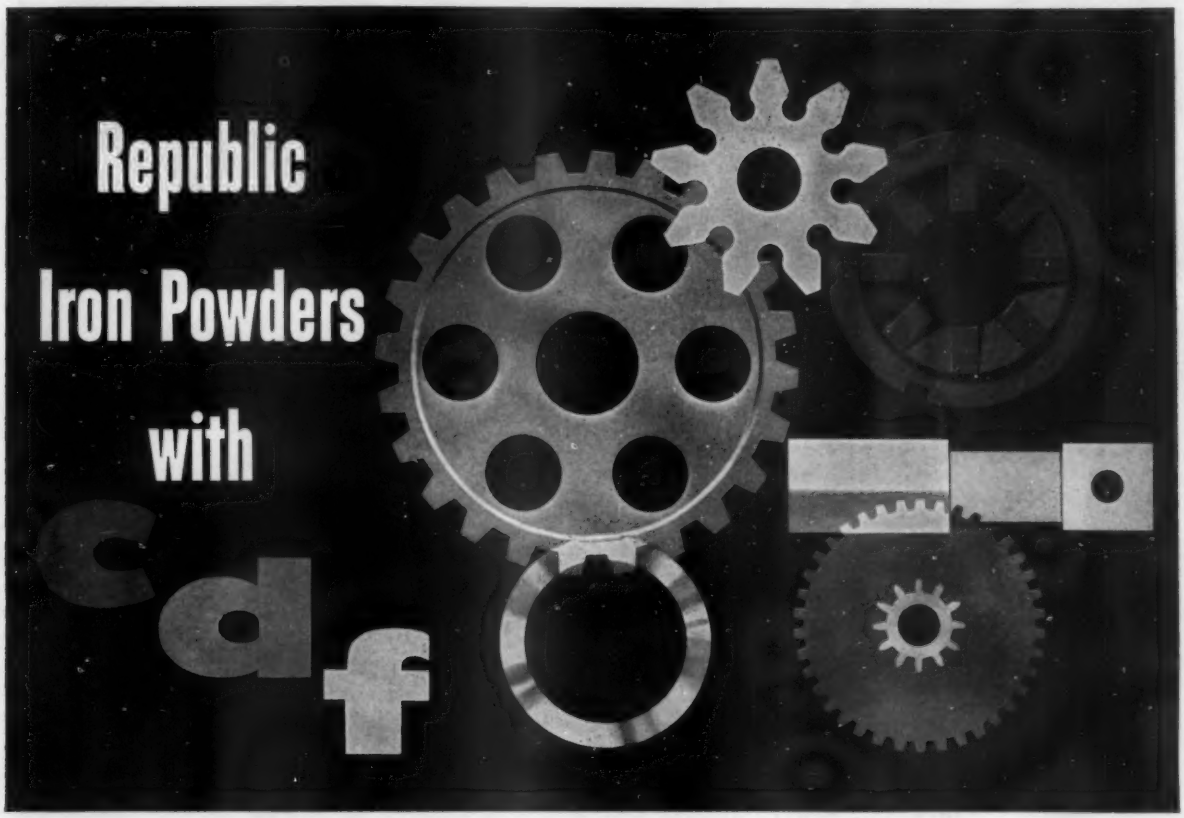

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Designers can hit goals on projected or production items. Consistently uniform shrinkage and growth characteristics help in die design and in establishing final dimensions of parts. Tool engineers can design tools to part print dimensions with the assurance that tolerances, transverse to the direction of pressing, can be held within ± .001 inches per inch. Fabricators can produce consistently uniform sinterings faster and at minimum cost.

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tap water—con and pro

Die casters continually ask about thinning aluminum die casting compounds with water. The advantages would be obvious—the supply is as limitless as your town's reservoir capacity, and the cost is nil.

But low first costs can be deceiving, and the use of water to thin most die casting compounds is a case in point. For instance, there are at least three possibilities you have to face: 1) since 80% of the United States is underlain with limestone, it means that the water you use has a good chance of leaving a mineral deposit on the die. 2) cool water can heat-check a hot die used for aluminum, making costly repairs necessary. 3) many die casters report that water won't wet a die thoroughly, and prevents an even distribution of coating.

We're inclined to place some stock in the above ideas, but not because we have an axe to grind. We do recommend our Die Slick #9 for *zinc* where conditions are not severe, and heats are low. It may be diluted with water. Some diecasters like it first rate, so we'll be happy to send you some if you write.

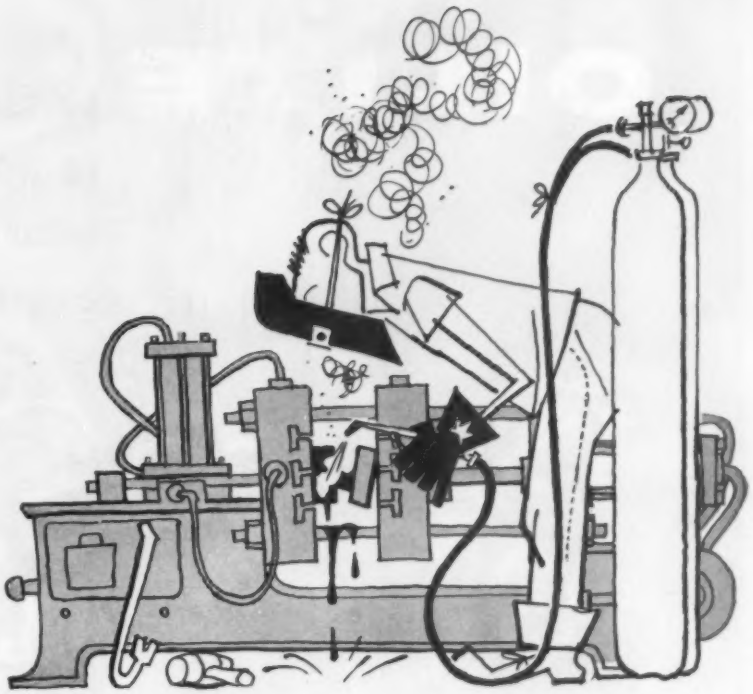
In our 17 years of experience (cluck, cluck) we've found that the best thinners are kerosene or mineral spirits, and sometimes mineral oil (but it's fairly expensive for what it does).

Very recently, however, we've been testing a thinner which seems to do a first rate job—better than the thinners mentioned above—on the toughest jobs. While we don't plan to market it just yet, feel free to write me for some if you'd like to try it.

Don't forget our 33X Die Slick for aluminum. Excellent reports are still coming in, but I'd like your approval to make the verdict unanimous.

Cordially,

V. W. Smith



Take the heat off . . . use Die Slick!

When die castings stick, operators sometimes resort to unusual methods to remove them. It's often funny unless you're the man who pays the bills. But hundreds of die casting plants, large and small, use Die Slick to avoid sticking, scoring, soldering and ejector pin wear. Even on those big, difficult parts there's a grade of Die Slick to make life easier for you, no matter what metal or alloy you are casting.

If you don't already use Die Slick, drop us a line telling us about your job. We'll be happy to see that you get a trial quantity . . . if you're not satisfied, we'll cancel the invoice.

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DIE SLICK

used by die casters everywhere

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With a modern power saw—easy does it. It's easier on the inside, too, because this manufacturer has equipped vital components with extra tough, greater wear resistant OILITE precision parts. The manufacturer's report indicates that OILITE powder metal sprockets and gears offer *greater wear resistance than alloy steels.*

Furthermore, in using OILITE precision parts the manufacturer of the power saw realizes *substantial cost savings over parts fabricated by any other process.*

What this manufacturer is accomplishing with OILITE precision parts, you can too. Or, perhaps, in your case OILITE self-lubricating bearings and bearing materials can help you lick the problem of providing lubrication in hard-to-get-at places. In permanent metal filters, too, OILITE provides a wide choice of shapes, sizes and porosities to meet product requirements.

Amplex—volume producer of Chrysler-engineered powder metal components—can meet your production schedules with on-time deliveries in any quantity.

Helping solve the problem of others is a daily occurrence at Amplex. This Chrysler-Amplex engineering service is available to you too.

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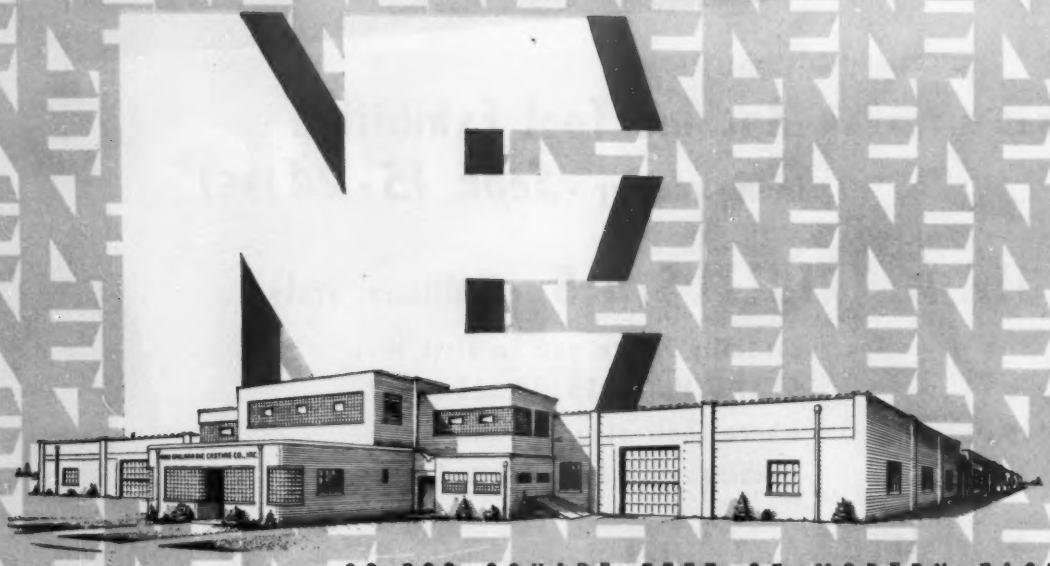

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For limited initial production . . . for pilot models . . .

Design Originally For Die Casting

by Edwin C. Foringer*

Edwin C. Foringer

"More or less by chance, our company has become a sort of nursery for new products. We have by experience — some of it bitter — worked out a sort of technique for this job. The usual controlling limitation on new products is that the proprietors — at least the ones who come to our door — are never wealthy. The product has to pay its own way after only the most modest investment in development and tooling. Yet if we are to share in the future of a product, we must try to design it originally, so that, as sales increase, we can convert one part after another from small lot to medium or to mass production methods, without at any time stopping production for a complete redesign. The parts from small-lot methods—sand castings—must be compatible with the same parts produced by better methods—die castings.

The number of new products flowing into the economy is required to be tremendous (the mortality rate of these new products is obviously large; there must be enough survivors left over to replace the obsolescent products continually retired from the market place, and enough besides to allow for expansion of the economy). Very few new products come to market by the carload or by the million. Some basement dreamer or some salesman gets an idea and starts a business. If the business doesn't fail, it grows to the point where he can think about die castings. That basement business is the point, it seems to me, where you have to start talking die castings."

WHEN a new product is born it often goes through a period of trial before it is generally accepted by the segment of the consuming public that might be interested in such a product. It is almost invariably true that during this period of trial, and perhaps change, it is highly uneconomical to utilize any of the mass production methods of parts manufacture since these methods almost always involve relatively large expenditures for initial tooling.

During the period of birth and early growth, the astute designer usually employs many sand castings, even though their use involves a large amount of machining and may not produce as well finished an end product as might be desired. But under these conditions changes are easily and rapidly made and there is only a relatively small investment in patterns involved.

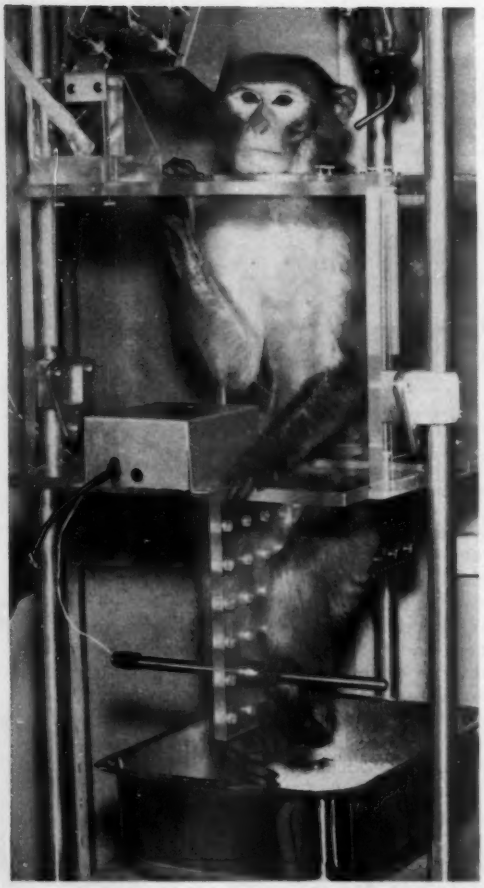
For those components which may develop into moderate or large production items, this same astute designer will make certain that a change to one of the higher rate production methods can be made with little or no design change. Then, when production quantities warrant, the change to die casting, for example, can be made easily and quickly. Production schedules are not interrupted and the only changes necessary are the retirement of certain machining operations as they become unnecessary.

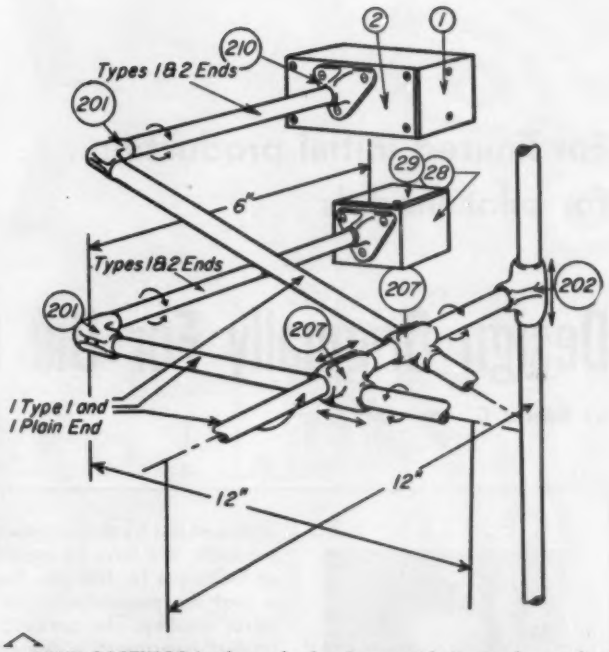
The Primate Chair shown in figure 1 illustrates how certain parts that may become moderately large production items are designed to be made eventually as die castings, but pending adequate production can be made as sand castings.

On this chair the various rod connectors and brackets shown in figure 2 have been designed so that they are directly transposable to die castings without any design changes. Further, a basic unit design is employed that can, by changing die inserts, be changed from a simple elbow to a tee or to a cross. The members carrying a pad for mounting flat components are visualized as separate castings.

These castings are now made in green sand molds. They must be given an over-all surface finish on an abrasive belt to produce the necessary smoothness.

*President, Foringer & Co., Inc.
Rockville, Maryland





2. SAND CASTINGS in the early developmental stages of a product that may eventually be a large volume item (such as the primate chair shown on the left) are designed for direct conversion to die casting without requiring even minor redesign. This advance thinking permits transition, when necessary, without interruption of production.

1. CASTINGS on this primate chair may be die cast eventually if the use of the equipment justifies large scale production.

The cored holes must be bored to secure the desired fit over the rods, and holes for the set screws must be drilled and tapped.

On those members carrying mounting pads, the pad face must be surfaced to present a smooth mounting plane and must be held in precise angular relationship to the center line of the bored hole. The pads must also be drilled and counterbored for wood or machine screws.

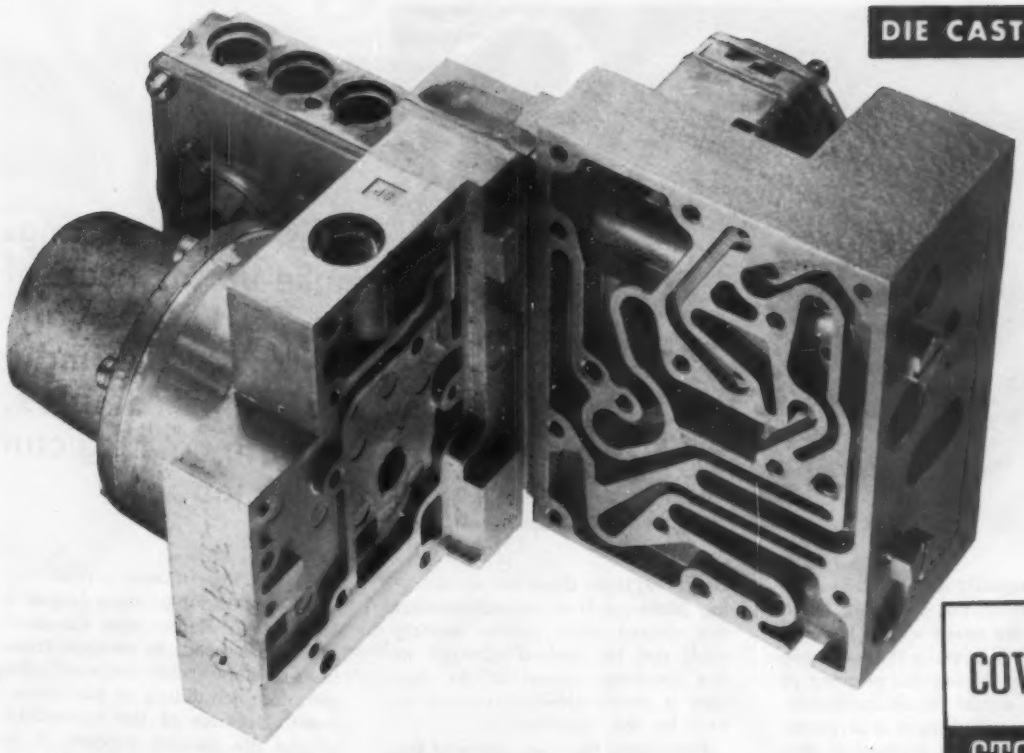
Now contrast this with die casting production. The as-cast surface will need no finishing other than smoothing of the parting line. The rod holes can be cast with sufficient accuracy so that no boring or reaming will be necessary and the set screw holes will be cored.

On those members carrying pads, the pad face will be flat as cast and in close enough angular relationship to the bore so that no correction will be necessary. Further all necessary screw holes can be cored complete with counterbore.

While tooling costs for the production of these components by die casting will be somewhat higher than for sand casting, the reduced machining costs will more than compensate for this increase. For these parts, the basic design has been careful enough so that even tooling costs will be relatively low. Instead of a separate set of tools for each differently shaped component, a basic design will be employed and changes in type of fitting made by changing die inserts in the basic set of tools.

For this Primate Chair, choice of material is important. Since the equipment is to be used for the retention of animals in psychological and physiological testing, there is bound to be a considerable corrosion problem. There will be spillage of both solid and liquid food as well as the natural secretions and excretions of the test animal, none of which can be controlled to any great degree. In addition, the equipment must be cleaned frequently and it is highly probable that relatively strong detergents will be used. All of the metal parts must, therefore, be capable of resisting the various corrosive and cleaning agents without the use of a protective coating such as paint or lacquer, and without requiring a plated surface. Die cast aluminum will fill all of the corrosion resistance requirements.

Numerous other components used on this equipment, but not illustrated, are also chosen as die castings. For example "V" belt pulleys, or floor flanges and similar parts are readily converted to die castings when quantity use dictates this method of fabrication.



COVER STORY

How Else Could You Make It?

by S. B. Pyfer*

Bob Knapp, Supervising Industrial Engineer, discussing the manifold casting and assembly with S. B. Pyfer, Purchasing Department.

INSTRUMENTS used for the control of temperature, pressure, flow, or any other variable where change can be recorded as a variation in air pressure, can all be controlled by the Tel-O-Set, a pneumatic controller widely used in the chemical, petroleum, and similar industries.

The changes in pressure resulting, for example, in the expansion of gas in a bulb when the bulb is heated or cooled are, in turn, transmitted to a portion of the Tel-O-Set metering device where a pneumatic circuit similar in appearance to a printed electronic circuit acts as a valving mechanism to actuate various portions of the control mechanism.

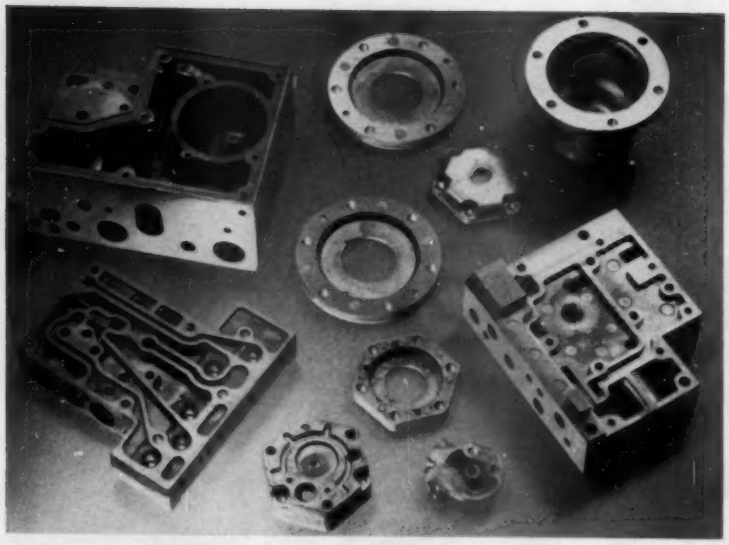
As the intrument was designed originally, all of the component parts were machined from wrought stock. This was extremely expensive and necessitated the use of a plurality of parts so that there was always a great danger of leakage and assembly costs were excessive.

When the decision was made to redesign the entire instrument, new design was thought of in terms of the die casting process. Through the use of this method of fabrication, it became possible to do exceptionally intricate coring and to make as a single piece what had formerly been an assembly of several machined components. The use of die casting gave a further advantage of compactness and allowed the designers to build more functions into the unit.

As can be seen from the several illustrations, many of the parts are extremely complex. They could, of course, be made by sand casting, permanent mold casting, or forging. In any of these three cases, however, a modified design would be necessary and the cost of manufacture would be considerably higher. For example, consider the manifold casting above. One side shows the intricate pneumatic circuit cast in, while the other side clearly shows how die casting has been able to reduce the amount of metal in a part of this size and complexity.

It is immediately obvious on examination of the pneumatic circuit that manufacture by any method other than a casting method would be out of the ques-

*Casting Buyer, Brown Instrument Division, Minneapolis-Honeywell Corp.



These 10 die castings make up the heart of the Tel-O-Set. Varying from very simple to highly complex, only die casting can do the job.

tion. It is equally obvious that sand casting could not be used, since many of the cores would have to have such thin walls that collapse or washing during the pouring of the metal would result inevitably.

Surface smoothness is a prime requirement in a circuit of this type, so that there shall be the minimum resistance to flow. This requirement obviated any method of manufacture other than die casting.

The design of this and all other portions of the instrument started with the foundry and continuous consultation based on the functional requirements and the ability of the foundry to meet these requirements, determined the design.

Among the various factors to be resolved by consultation were volume tolerances of the various channels, wall thicknesses between the channels, coring of holes, and freedom from porosity.

In the manifold casting as well as in all other castings, it will be noted that there is a plurality of holes. Some of these are clearance holes for machine screws, some are threaded for tubing connectors, and some are valving holes. With the exception of cover plate holes which hold a gasketed cover, all holes in the castings are cored.

In the majority of cases commercial tolerances are applied. Some holes, however, require a center-to-center tolerance of as little as .003. Two face holes in the casting require an accuracy which can be secured only by reaming. However, since these are air carrying passages, it is imperative that the chilled skin of the casting shall not be broken through in the reaming operation. In this case a much closer tolerance is held by the foundry.

Because of the complexity of the various parts and because considerable machining has to be done in some places, it has been impossible thus far to make these castings entirely non-porous. Rather than do 100% inspection, all castings are impregnated with a Meta-seal impregnant.

Normal machining operations which must be done are surface grinding to accommodate gaskets, reaming, tapping, drilling, and a very small amount of milling. As is usual with die cast components, one of the major aims of the designer is to eliminate to as great an extent as possible all milling operations, since these are by far the most expensive in any shop.

Normal operating pressures for the unit will vary from 3 to 15 psi, but all units are tested at 30 psi.

There is no finishing of any type done by the foundry on these castings other than normal trimming, all machining being done within the Brown Instrument Company plant.

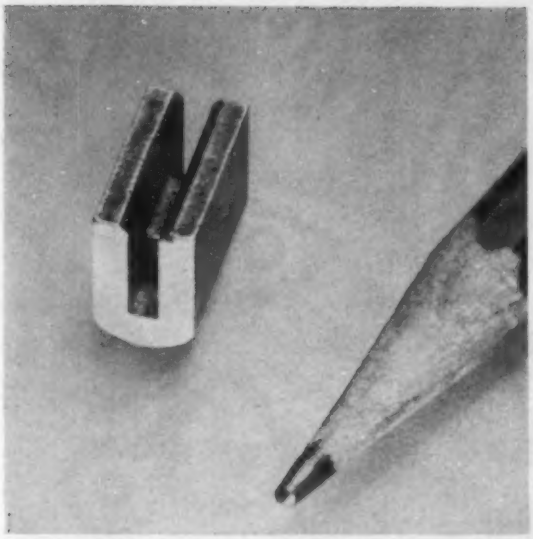
Surface finish is quite simple. The castings to be finished are given an alkaline dip to clean and degrease them, and then a single coat of Hammertone enamel. Baking, as is normal for this finish, completes the job.

An interesting feature of these Tel-O-Set instruments is that they can be made for either a fast or a slow reset. Before the die castings were used, to change from fast to slow reset required the complete rebuilding of the instrument. Because of the versatility of the die casting process, it is possible to accomplish this change merely by the removal of one machine screw.

All castings are made in No. 13 alloy, which has good castability and gives parts with the lowest possible porosity. Each Tel-O-Set contains ten different die castings, all of which are made by the same vendor, the Newton New Haven Corp.

Cost comparisons are, of course, impossible on an instrument of this type since the functions built into it and the job it will do cannot be accomplished unless die castings are used. It is interesting to note, however, that the complete die costs for seven of the castings in use cost $23,000 in 1953. Considerable ingenuity went into these dies. It was felt at the time of the original design that die changes would be necessary as experience with the parts showed either misconceptions, or indicated that additional functions could be added. The dies were designed, therefore, so that all conceivable changes could be made by metal removal and no parts added to the dies by welding or other methods.

Wherever inserts occur in the castings, such as steel locking pins, they are pressed in after the casting has been made and fully machined.



Effortless... Quiet...

A Sliding Bearing For Life-time Service

1 PERMANENT LUBRICATION provided by this sintered bronze bushing member will provide smooth, quiet, easy movement of the seat. Once assembled, no further attention will be needed.

THE use of oil-impregnated, porous bronze bearings and bushings is well established practice in industry. For the most part, however, when the designer thinks of such bushings and bearings he thinks in terms of a round shaft rotating in a sleeve bushing of rather standard design. There are, however, innumerable applications of pure sliding motion (as distinguished from rotation) where the unique features of oil impregnated bronze, or porous iron, could be used to advantage.

Not only will this outstanding product of the powder metallurgy industry do a better job of lubricating in many cases, it will often allow the use of a particularly desirable design which would have to be discarded were it not for the ability of the powder metallurgist to achieve the seemingly impossible.

For example, consider the bearing element shown in figure 1. This little part is used by American Seating Company on some school and theater seats where the seat portion must slide horizontally on a fixed frame.

The part looks simple, but actually is one that could not be made in its present design by any method other than as a sintering. The sketch in figure 2 shows how an interior key has been incorporated into the bearing member to eliminate machining operations, reduce the number of parts to be assembled and simplify the assembly operation.

In construction, the seat has two steel strips approximately ⅛ inches thick fastened to the under side. These strips, in turn, ride in steel channels that form a portion of the fixed frame and supporting structure. Obviously if poor bearing and lubrication were provided, it would soon become impossible to slide the seat in the channels, particularly when the seat is occupied. It is imperative, therefore, that a bearing material of low coefficient of friction be employed to permit easy movement. It is equally obvious that no dependence can be placed on periodic oiling to maintain the desired ease of operation.

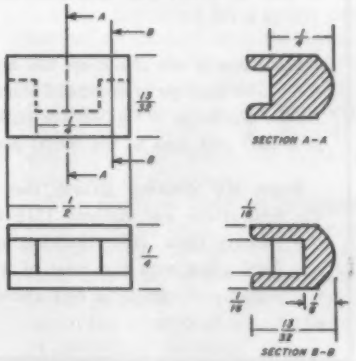
These considerations eliminated all materials except nylon or oil impregnated metal. Obviously sealed ball bearings could be used, of course, but the cost of the bearings plus the far higher manufacturing costs immediately eliminated them.

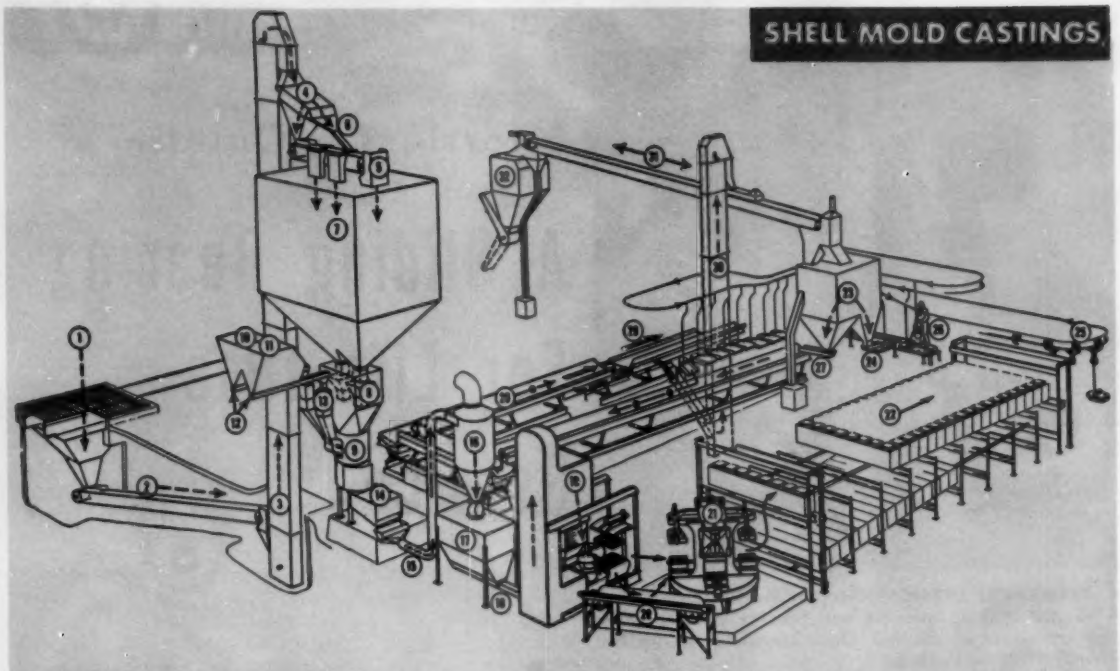
Cost factors coupled with the results of life testing of the seats eliminated both nylon and porous iron bearings. The bronze part made by Keystone Carbon Company that is now used has proven to be entirely satisfactory.

The key previously mentioned and shown in figure 2 is easily incorporated in the molded part and probably has not increased the part cost appreciably. Were it not used, a separate pin would have to be employed to hold the bearing in place on the slide. This would require an extra drilling operation, an additional part — the pin — and an extra assembly operation that would, of necessity, be rather slow.

In assembly a notch is cut in the slide fastened to the seat. The bearing is slipped on until the key locks into the notch. Assembly is then complete.

2 MOLDED and sintered to final shape and dimensions, assembly is simple and rapid.





SCHEMATIC VIEW of a modern, fully automatic shell mold foundry. One complete mold every 15 seconds can be made.

A Casting Replaces A Forging

TO FOLLOW THE SCHEMATIC VIEW OF THIS FOUNDRY . . .

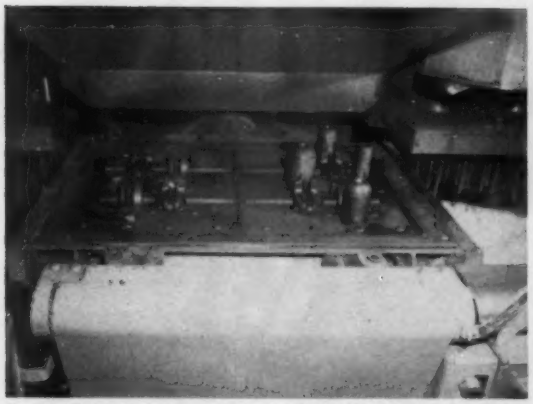
Sand from the railroad cars is unloaded into a track hopper (1), then carried by a belt conveyor (2) to a 53 ft. high bucket elevator (3) which elevates it to a single deck vibrating screen (4). Discharge from the screen is into two hoppers (7) for pre-coating storage. At the bottom of each bin a measuring hopper delivers a predetermined amount of sand into a muller (9) while resin and iron oxide in measured amounts are fed in by screw conveyors (10 to 13). Discharge from the muller is onto a screen (14) and then into a surge hopper and dust collector (15, 16 & 17).

Shell molds are made on the four station automatic machine (19, 20 & 21) and then go to overhead storage (22) with a capacity of 832 molds. At the discharge of the storage rack the molds are placed on the pouring line (25) and pass to the metal pouring station (26).

From the pouring station the molds, with backing sand, pass to the first shake out stations (23) then on vibratory conveyors (28) to the picking table (29). Backing sand and the smaller pieces of mold are discharged into the boot of a bucket elevator (30) which carries the mixed material to a belt conveyor (31) and thence to storage (23 or 32).

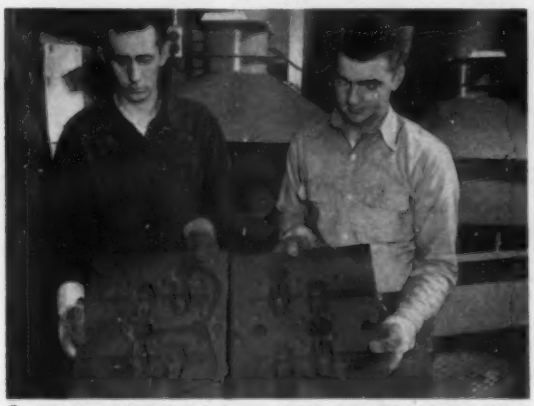
THE new shell mold foundry at the Evinrude Motors plant in Milwaukee is the final result of a decision in 1952 to substitute a cast crankshaft for a forging. A 100 percent shell mold operation, the foundry is among the most highly mechanized shell mold foundries in the United States and the first in the outboard industry. A high piece volume, low-tonnage operation by normal foundry standards, the Evinrude foundry is specifically designed to produce steel crankshafts for outboard motors.

Why did the Evinrude people decide on the shell mold process? In 1954 a pilot foundry was set up with minimum melting, shell molding and related equipment after the possibilities of the shell mold process had been recognized. The pilot plant proved the feasibility of making the castings from the shell molded process and indicated the savings that would result. Also noted were improve-



1 PATTERN for drag and cope halves of a shell mold in position in a shell mold machine.

2 INVESTED pattern is put through the cure; the shell mold is automatically removed.



3 DRAG AND COPE halves of a shell mold before sealing together with an adhesive.

4 SEALING the cope and drag halves of the pattern together with adhesive. Pressure but no heat is needed.

ments in the bearing quality of the crankshafts.

Result: The shell mold castings now being used instead of forgings, bring a considerable saving because of the reduction in steel required per crankshaft and the elimination of some machining operations. The castings are of more closely controlled metallurgical quality than the forgings previously used.

The foundry was jointly designed by Evinrude and Link-Belt Company. The handling of sand is completely automatic from the railroad cars to the completed shell at the ejection station of the shell molding machine. The heart of the system, a Link-Belt four-station shell molding machine, can produce a thin shell of resin-bonded sand every 15 seconds, and a shell closing machine seals the cope and drag halves of the molds together.

From the railroad car track hopper the sand is carried, by a conveyor belt, into the building. After being lifted above the foundry floor by a bucket elevator, the sand is discharged onto a semi-enclosed vibrating screen.

A belt-conveyor delivers the sand to a two-compartment storage bin. This double bin is one of several provisions for the future to handle a two-sand system, should it be needed.

After a completely automatic mixing operation with resin, iron oxide and an alcohol-water solvent for cold coating, the sand is discharged from the muller onto a vibrating screen and then conveyed pneumatically to a surge hopper at the shell molding machine.

The shell molds are made on a four-section shell molding machine which is in one compact unit. The shell size is 19½ in. by 29½ in., and the production rate is 120 per hour when operating on a fully automatic cycle. Cope and drag halves are made simultaneously and close to form a 14¾ in. by 19½ in. mold.

At the beginning of a shell mold cycle a water-jacketed flask is lowered onto the pattern and is filled with a measured amount of resin-coated sand. This material adheres to the pattern, and the sand and resin fuse to form a thin plastic shell.

After the sand and resin are bonded to desired shell thickness, the pattern, with its adhering layer of sand and resin, is moved to two successive curing stations, where the shell is baked under electric heaters until the desired hardness is obtained.

The finished shell is stripped from the pattern automatically at the ejector station. The drag half, after being cored, is transferred to the shell closing machine while the cope half is transferred

(Continued on page 79)

Steels For Die Casting Dies

Over the years, the number of different compositions of steel for use in the manufacture of die casting dies has been reduced to five major types. These are typified by the AISI classes H-11, H-12, H-13, H-21 and P-20. Some few others are currently manufactured but by far the majority of the die casting dies are made of one of these five classes of steel.

In the following tables the trade names, composition limits, heat treatment and general properties of these steels are given. Each steel listed (by AISI class number) is made by at least two of the companies listed.

The general recommendations of the different companies for these steels is:

For zinc base die castings — P-20

For aluminum and magnesium base die castings — H-11, H-12, H-13

For brass die castings — H-21

Where exceptional conditions are anticipated such as very thin die walls adjacent to much heavier sections, much larger than normal die blocks, higher than normal casting temperatures or any other condition that represents a major departure from normal die design or usage, the steel company furnishing the die blocks should always be consulted prior to purchasing the blocks.

Some steels are now available in the fully heat treated condition so that dimensional changes need not be considered. Concerning these materials the steel companies' recommendations should be carefully followed even though they may seem at variance with normally accepted practice.

Trade Names

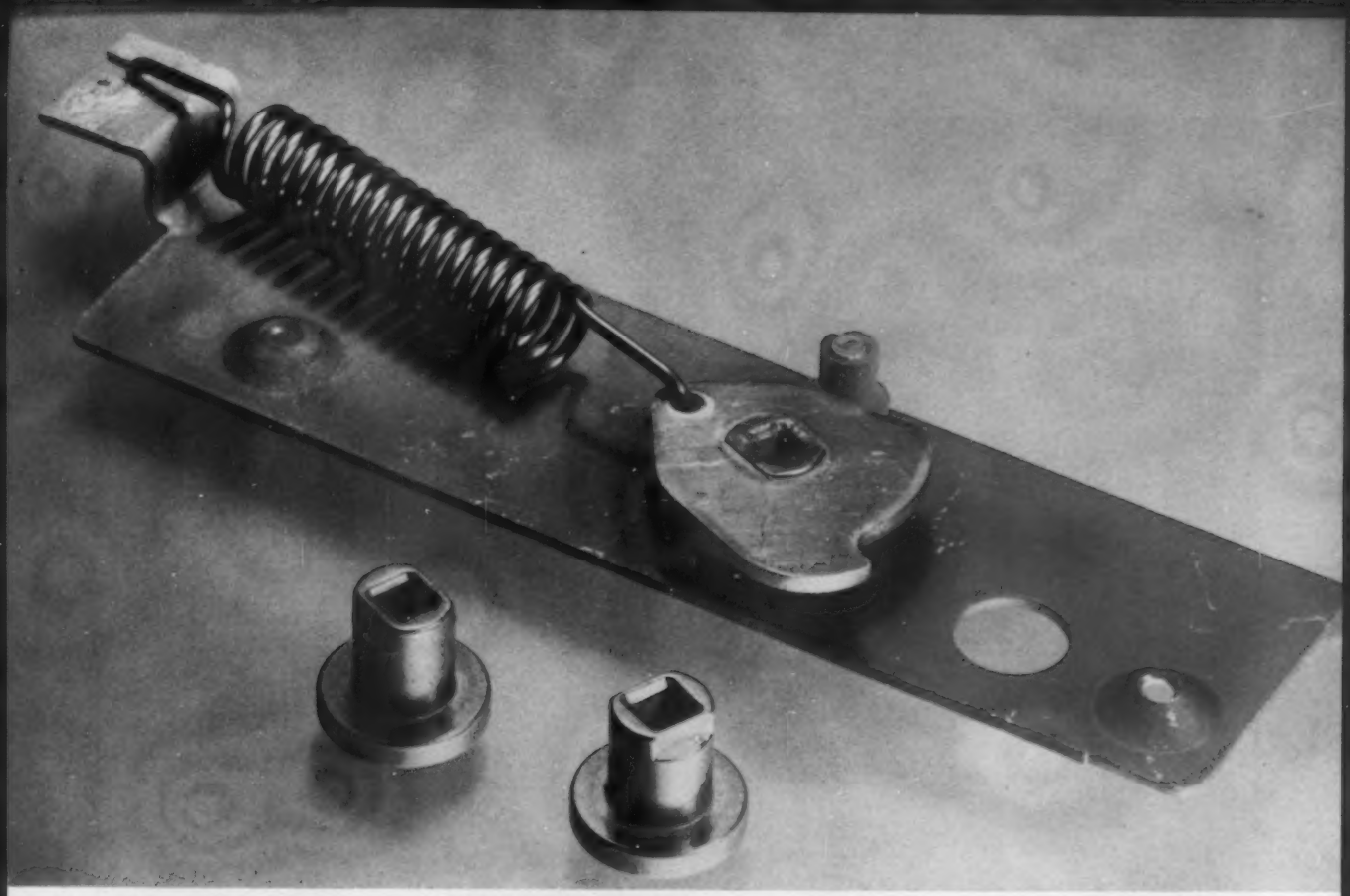
AISI No. →	H-11	H-12	H-13	H-21	P-20
Allegheny Ludlum		Potomac	Potomac M	Atlas A	
Bethlehem	Cr-Mo-V	Cr-Mo-W	Cr-Mo-V (High V)	57 Hot Work	Multimold
Braeburn	Pressurdie No. 3-L		Pressurdie No. 3	T-Alloy A	
Carpenter		No. 345	No. 883	TK	
Columbia	Firedie	Alcodie	Vanadium Firedie	Formite No. 2	Plasdie
Crucible	Halcomb 218	Chro-Mow	Nu-Die V	Peerless A	
Disston		Mix 875		No. 872	
Firth Sterling	HWD-2		HWD-3	LT	
Heppenstall	EIS-H720		EIS-H720		
Jessop	Dica B Mod.	Dica B	Dica B Van.	28-LC	
Latrobe	Dicast-1	LPD	VDC	CLW	
Universal Cyclops	Thermold A	Thermold B	Thermold AV	B-44-J	
Vanadium Alloys	Hotform No. 2	Hotform No. 1		Marvel	
Vulcan	Magal	TCM	Vulcast	30 Calo-Ferro	

Composition, Heat Treatment & Properties

	H-11	H-12	H-13	H-21	P-20
C	0.30-0.40	0.30-0.40	0.30-0.40	0.30-0.50	0.27-0.33
Mn	0.20-0.40	0.20-0.40	0.20-0.40	0.20-0.40	0.65-0.85
Si	0.80-1.20	0.80-1.20	0.80-1.20	0.15-0.30	0.40-0.60
Cr	4.75-5.50	4.75-5.50	4.75-5.50	3.00-3.75	0.70-0.85
V	0.30-0.50	0.10-0.50	0.80-1.20	0.30-0.50	
W		1.00-1.70		8.75-10.00	
Mo	1.25-1.75	1.25-1.75	1.25-1.75		0.20-0.30

	H-11	H-12	H-13	H-21	P-20
Annealing Temp.	1530	1550	1550	1400	1450
Annealing Rate of Cooling	50°/hr	50°/hr	50°/hr	50°/hr	50°/hr
Hardening Preheat	1500	1500	1500	1500	1200
Hardening Temp.	1800-1850	1825-1875	1825-1900	2000-2200	1500-1550
Quench	Air	Air	Air	Oil or Air	Oil
Tempering Temp.	1000-1200	1000-1200	1000-1200	1100-1250	900-1000
Useful Hardness Rc	38-52	38-52	38-52	42-54	30-35

Note: Temperatures in degrees F.



1 **HIGH HUMIDITY** and relatively heavy loading posed severe design problems for this freezer door hinge stud. Stainless steel sinterings solved the problem.

Strong, Ductile, Tough Stainless Sinterings

CORROSION resistance is secured through the use of 18-8 type of stainless steel powder.

HIGH TORQUE must be transmitted by this sintering. Proper pressing and sintering techniques make this possible.

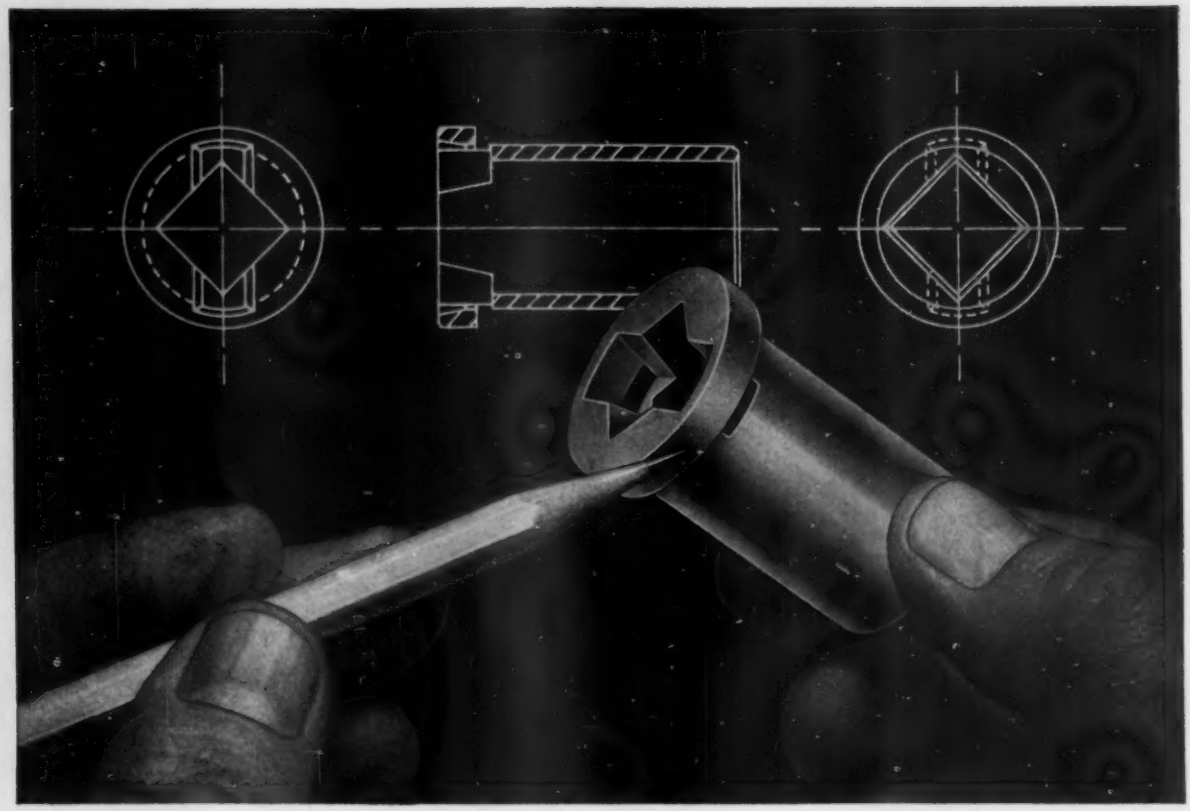
DUCTILITY is important if the hinge stud is to be fastened to the cam by a simple staking operation.

WEAR resistance is another requirement since the stud is mounted inside the cabinet where replacement is most difficult.

WHEN the interior door of the freezer compartment on a Kelvinator refrigerator closes, it must seal tightly against a rubber strip to prevent undue heating of the frozen food while the main box door is open. But upon opening the freezer compartment door, a combination action must occur. The door must pull down to give access to the freezer and to form a shelf in front of the freezer and at the start of the hinging action it must also move horizontally away from the rubber seal to prevent displacement or other damage to the gasket. Both of these actions, the horizontal movement to break the seal and the downward hinging must operate against reasonably strong spring tension. This all adds up to a severe torsional stress on the various hinge members.

Two views of the mechanism that perform the required action are shown in figure 1. The door itself carries a square hinge pin which fits into the hole in the freezer door hinge stud. The stud, in turn, is fastened to a stainless cam which rides against a fixed nylon pin. As the door is opened the stud and cam rotate through 90 degrees. The cam shape is such that during this rotation the stud, and hence the door also, are moved forward approximately 3/16 inches. All of these movements are opposed by the spring shown in one view in figure 1.

Continued on page 69



How Would YOU Produce This Part With No Machining . . . No Scrap Metal?

PARKER SALES ENGINEERS

CHICAGO 49, Ill.
Ollie J. Berger Company • 2059 East 72 Street

CINCINNATI 14, Ohio
William H. Broxterman • 2430 Central Parkway

DETROIT 35, Mich.
Hodgson-Geisler Co. • 18917 James Couzens

GIRARD, Penna.
Daniel F. Marsh • 35 Chestnut Street

KIRKWOOD 22, Mo.
Edward F. Higgins, Jr. • 102 West Adams Street

WILTON, Conn.
Girard L. Palmer • Belden Hill Road

SYRACUSE, N. Y.
J. C. Palmer • 712 State Tower Bldg.

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Can't be done? Parker did it . . . sharp internal corners, lateral holes, chamfers, flanged end and all . . . by fast, low-cost powdered metal pressing and sintering. No subsequent machining . . . no scrap-metal loss. Just think of the savings compared with conventional machining methods.

In addition to these inherent cost savings, Parker-engineered Powdered Metal Parts offer a wide choice of tensiles, ductility, density, impact resistance and other physicals. Tooling-up is done quickly and at relatively low cost.

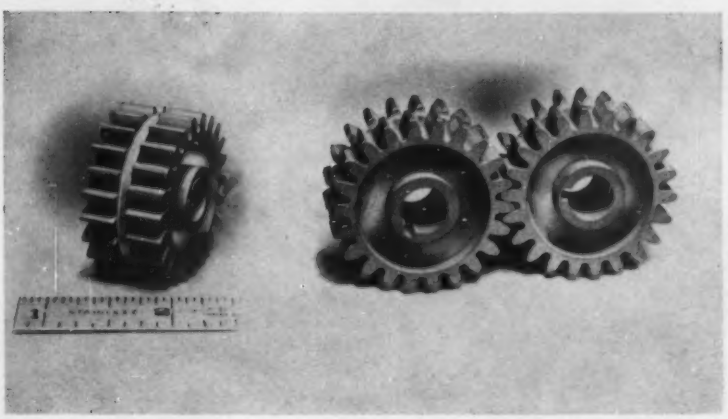
It will pay you to check on the economies and design possibilities of Parker-engineered Powdered Metal Parts. Just call the nearest sales engineer listed here or write the factory direct.

Parker White Metal Company • 2153 McKinley Ave., Erie, Pennsylvania

PARKER

high pressure ALUMINUM and ZINC die castings
POWDERED METAL PARTS

For more information circle No. 42 on the Reader Service Card



1 CASTING of helical gears can be impossible if a high helix angle is required. With this off-set tooth gear the same efficient power transmission is possible in a shape that is easily die-cast in dies that are relatively inexpensive.

For heavy power transmission

An Offset Tooth Spur Gear

UNDER certain conditions helical gears are essential to secure the power transmission needed and at the same time hold the size within tolerable limits. However, the problem of die casting a helical gear involves the use of a highly complex ejection mechanism which must rotate in a very precise manner as the gear is ejected from the die. It has been found, also, that the helical angle must be low because the torque required to eject a gear with a high helical angle is so great that shearing of the teeth almost invariably results.

To secure the advantages of a helical gear with any desired helix angle and, at the same time, have the part die castable, a new gear design has been developed by the ZYX Die Casting Company of Greensboro, N. C. The basic design of this gear is shown in figure 1.

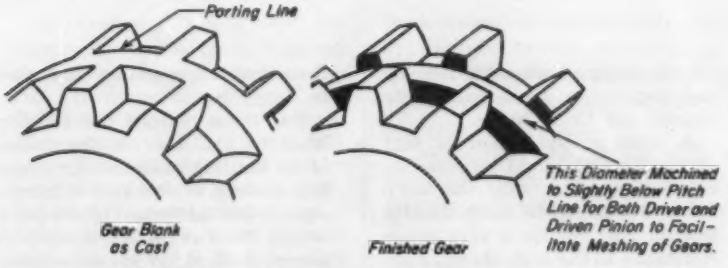
It can be seen from the sketches that the gear is readily die castable, that ejection is as simple as for any other straight gear, and that tooth contour can be as close to a true involute as the die maker can produce.

It is claimed that the construction of this gear is such that small gears have the equivalent strength of much larger, straight-toothed spur gears, with a resultant saving in materials. A further saving is made in die construction costs, since a straight hobbing tool can be used to form the die cavities.

As cast, the web between the offset teeth is flush with the top tooth surface. After casting, this web must be machined to slightly below the pitch diameter for both the driver and the driven gear, so that proper meshing of the teeth can be accomplished.

Any die castable metal can be used for the manufacture of this gear and, in fact, other precision manufacturing methods such as shell molding, investment casting, powder metallurgy, and permanent mold casting can also be used.

It is claimed that the design of this gear gives it smoother running action, quieter operation, and higher efficiency than can be obtained with spur gears. Obviously the same design can be applied equally for racks, internal gears, bevel and miter gears.


Parting Line
Gear Blank as Cast
Finished Gear
This Diameter Machined to Slightly Below Pitch Line for Both Driver and Driven Pinion to Facilitate Meshing of Gears.

2 AS CAST the web between the two rows of gear teeth is flush with the tooth faces. To finish, the web is machined out to below the pitch diameter. Maximum shear strength is thus preserved.

1 ELIMINATION of assembly operations, reduced machining, corrosion resistance and good wear resistance are some of the reasons for using investment castings in these parts. Shown are (a) drum levers, (b) raising cams, (c) downpick, (d) safety cam and (e) support.

Freedom from corrosion and resistance to thread abrasion in . . .

Textile Machinery Castings

By W. REESER*

MACHINERY used for the manufacture of ladies' hosiery requires that all of the parts be precisely made so that intricate timing action of the knitting machine will be correct. It is necessary also that all parts subject to even the slightest wear be of a material which will stand up for a reasonable length of time since the wear of any single part can throw the timing of the machine off, resulting in unusable hosiery and expensive down-time while repairs are being made.

A third consideration is that all parts which might conceivably come in contact with the very fine nylon thread be exceptionally smooth and yet have very great resistance to the high abrasive action of the nylon.

Naturally it is important also that the method of manufacture of these parts be such that the entire machine can be turned out at the lowest possible cost, since these knitting machines are used in large numbers.

For these reasons the Fidelity Machine Co., Inc., in the design of its knitting machines for seamless hosiery, determined at the design stage that certain of the parts would be investment cast. A group of these typical investment castings is shown in figure 1. All of them are cast in 4130 or 52100 steel and are hardened after casting and final machining.

Included in the parts illustrated are the downpick, a safety cam,

*Chief Engineer,
Fidelity Machine Co., Inc.

and two raising cams, as well as several different designs of drum levers.

Examination of the various pieces quickly reveals that most of them fall into the class of "How else would you make them economically?".

While it might be possible in the case of the drum levers, for example, to form them by blanking and shaving in order to secure the bosses and recesses required, a great deal of milling machine work would have to be done and this would run the cost of the part well above any economic level. In nearly every case the parts are delivered almost finished. Some drilling, grinding, reaming and tapping is necessary, but these are all very fast, very economical operations. In a few cases a little milling is required also.

The saving effected through the use of investment casting has been estimated at 75% on parts such as the drum lever. On the more complex parts the saving is even greater.

It is a credit to the companies making the investment castings that rejects are essentially negligible. Certain of the parts in the early stages of production were out of flat, and where a long, relatively thin member is present, there was some bending. However, all of these troubles were overcome successfully by the investment foundries so that this source of trouble no longer leads to rejects.

Because the parts must be machined for final assembly to dimensional tolerances much closer than it is possible to cast, standard foundry tolerances are allowed in most cases. Some few dimensions are held closer than normal commercial tolerances, but these are not many.

By working closely with the suppliers of these parts, National Precision Casting Company, Jelrus Precision Casting Corp., the Harcast Company, and Precision Metalsmiths, Inc., Fidelity Machine Company has been able to work out a set of casting specifications requiring a minimum of finishing operations after the castings are received and, at the same time, allow the foundries sufficient latitude so that the cost of the individual castings is not excessive.

Plated under vacuum, these articles have a high-sheen surface that lasts as long as conventionally plated pieces.

Why plating
with vacuum
is easier and more profitable

Without buffing or polishing, without corrosive cleaning baths, without highly skilled help, you can now cover articles like those shown above with a shimmering finish that lasts for years.

All it takes is a CEC vacuum coater and some inexpensive lacquers to make metal and plastic articles look silver, gold, copper, or a multitude of other colors and tones.

Vacuum-plating costs less. With a CEC vacuum coater you can plate thousands of pieces per day with unskilled labor.

New longer-lasting lacquers. There are on the market many lacquers which can make vacuum-plated articles wear as well as those plated in conventional ways.

The stayfast finish requires no retouching, or buffing, or polishing—just an easily applied coat of lacquer.

You can control film thickness easily and precisely. You can make surfaces electrically conductive *or* insulating as you wish.

For further information on this highly profitable process, write for information on the coaters, the lacquers, and the methods used.

1450 2½" diameter pieces per cycle, 3 to 6 cycles an hour—that's the production rate of this 48" CEC vacuum coater.

Consolidated Electrodynamics
Rochester Division, Rochester 3, N. Y.
formerly Consolidated Vacuum

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

DATA OFFERED IN THIS MONTH'S ADS

the Reader Service Cards on the facing page will get you these free reference materials. Circle the numbers and mail.

5. **Aluminum Alloy**—designed specifically for die casting is fully described and the as-cast properties given is specification sheets on alloy Z-39 from Apex Smelting Co.

9. **Die Casting Machines**—A new brochure from B&T Machinery Co. discusses the latest and best developments in die casting equipment. Hot and cold chamber machines for zinc and aluminum, are described.

10. **Magnesium and Aluminum Castings**—A 24-page booklet, Bendix Foundries, describes the company's new plant. Complete data is furnished on the advantages of aluminum and magnesium castings.

11. **Engineering Handbook**—A 24-page handbook published by Bunting Brass and Bronze Co., deals with sintered powdered products and their composition, manufacture and application.

12. **Refractories**—that cannot be wet by molten aluminum are discussed in a bulletin by Carborundum Co. Included is a product list and technical articles on Refrax materials.

13. **Die Casting Machines**—Eight die casting machine models with a variety of "bonus" featured are described in a catalog from Cast-Master, Inc.

16. **Die Casting Machines**—Complete information is available in a series of bulletins from Cleveland Automatic Machine Co. on the company's product. Complete machine specifications are included.

17. **Vacuum Plating**—is presented with information on coaters, lacquers, and methods in data available from Consolidated Electrodynamics.

18. **Special Castings**—Crucible Steel Co. of America offers a booklet showing the facilities of the company for producing tool steel castings by the investment and other processes.

20. **Die Cavity Sets**—A 12-page brochure from Detroit Mold Engineering Co. gives complete prices and specifications on six new standard sizes of cavity sets for die casting.

21. **Chain Conveyor Testor**—W. C. Dillon Co. offers an illustrated color catalog on the Dillon Dynamometer which can test moving chain conveyors for overload in less than 60 seconds.

23. **Saves $5400**—Bulletin C-80 from Eclipse Fuel Engineering Co. describes a double-chamber dry-hearth-type metal melter for aluminum. Advantages for both large and small operations are discussed.

25. **Shell Molding Problems**—are answered in a brochure, "59 Answers to Your Shell Molding Problems", by General Electric Co. A description of G-E resins and their properties is included.

26. **Zinc Die Casting**—Gries Reproducer Corp. has released a bulletin on small zinc die castings. The company's one high-speed automatic operation without scrap loss is described.

27. **Small Die Castings**—A fact-filled bulletin from Gries Reproducer Corp. explains their "Intercast" method of producing zinc-alloy units with moving elements in a single operation which is automatic.

28. **Briquetting Presses**—Design and engineering data sheets are available from Haller, Inc. on their hydraulic and mechanical briquetting presses built for speed, accuracy, and economy.

29. **Alloy Chart**—A helpful alloy wall chart is available from Henning Bros. and Smith. Compete data and properties are included for all alloys.

30. **Investment Castings Design**—A brochure has been published by Hitchiner Mfg. Co. to aid the engineer is designing for the best and most economical use of investment castings.

34. **Casting Problems**—The Investment Casting Co. has issued a brochure to help design engineers with their special casting problems.

35. **Die Casting Machines**—An illustrated catalog from the Kux Co. gives all of the specifications and much operating data on the entire line of die casting machines.

40. **Standard Bearings**—National Molded Products, Inc. has issued a listing of standard size bushings and bearings carried in stock. Sizes, load data, etc. are given.

46. **Vacuum Die Casting**—Full details on die casting by the "Vacucast" system for increased production and higher profits are offered by Reed-Prentice Corp.

47. **Iron Powder**—Information on iron powder with a controlled dimensional factor, "CFD", is available from Republic Steel Corp. The bulletin shows how the company's product has predicable dimensional characteristics after sintering operations.

52. **Melting Furnace**—Catalog 150 has been issued by Stroman Furnace & Engineering Co. describing their "DC" cylinder type furnaces for combination melting and holding aluminum. The furnaces are equipped with contained combustion burners.

56. **Finishing Non-Ferrous Metals**—Detailed laboratory and engineering reports on the finishing of non-ferrous metals by the "Iridite" process available from Allied Research Products, Inc.

57. **Barrel Finishing**—A 52-page barrel finishing handbook is available from Almco, Division of Queen Stove Works. Information is also available on the company's line of finishers.

58. **Zinc Plate Coating**—Data sheets and prices are available from the Chemical Corp. on their "Luster-on 52" single-dip, no leach conversion coating for zinc plated surfaces.

61. **Metal Finishing**—A folder describes the Hanson-Van Winkle-Munning Co. fast cutting, easy cleaning liquid compound that is automatically-applied and eliminates hand application and bar changing.

63. **Strip Paint Problems**—If tough finishes resist present stripping methods, Oakite Products, Inc. offers helpful information in two booklets: "How to Strip Paint," "Here's the Best Shortcut in the Field of Organic Finishing."

64. **Magnesium Dust Control**—The "wet method" of magnesium dust collection and control is the best, according to a brochure from Peters-Dalton, Inc.

67. **Cap Screws**—Special socket head cap screws are just one of many products listed in the Detroit Mold Engineering Catalog.

69. **Die Casting Supplies**—An illustrated bulletin from ACF Industries, Inc. describes their complete line of pots, castings, ingot molds, and goosenecks for the die casting industry.

Continued on page 79

PMM AT YOUR SERVICE

THE MOST MODERN Reader Service Department in the publishing industry is staffed, equipped and trained to serve you at PMM. Automatic equipment processes your requests and shoots them on for fulfillment within hours after receipt. The materials you want get to you fast.

THESE TWO CARDS are your tickets to this prompt service. Use them to secure details about any item in this issue that has a key number. These are:

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THIS PLANT PRODUCES TYPES OF PARTS CHECKED BELOW:

- ☐ Die Castings
- ☐ Investment Castings
- ☐ Powder Metal Parts
- ☐ Permanent Mold Castings
- ☐ Plaster Mold Castings
- ☐ Shell Mold Castings
- ☐ None of these

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1	18	35	52	69	86	103	120	137	154	171	188	205	222	239	256	273	290
2	19	36	53	70	87	104	121	138	155	172	189	206	223	240	257	274	291
3	20	37	54	71	88	105	122	139	156	173	190	207	224	241	258	275	292
4	21	38	55	72	89	106	123	140	157	174	191	208	225	242	259	276	293
5	22	39	56	73	90	107	124	141	158	175	192	209	226	243	260	277	294
6	23	40	57	74	91	108	125	142	159	176	193	210	227	244	261	278	295
7	24	41	58	75	92	109	126	143	160	177	194	211	228	245	262	279	296
8	25	42	59	76	93	110	127	144	161	178	195	212	229	246	263	280	297
9	26	43	60	77	94	111	128	145	162	179	196	213	230	247	264	281	298
10	27	44	61	78	95	112	129	146	163	180	197	214	231	248	265	282	299
11	28	45	62	79	96	113	130	147	164	181	198	215	232	249	266	283	300
12	29	46	63	80	97	114	131	148	165	182	199	216	233	250	267	284	301
13	30	47	64	81	98	115	132	149	166	183	200	217	234	251	268	285	302
14	31	48	65	82	99	116	133	150	167	184	201	218	235	252	269	286	303
15	32	49	66	83	100	117	134	151	168	185	202	219	236	253	270	287	304
16	33	50	67	84	101	118	135	152	169	186	203	220	237	254	271	288	305
17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306

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4	21	38	55	72	89	106	123	140	157	174	191	208	225	242	259	276	293
5	22	39	56	73	90	107	124	141	158	175	192	209	226	243	260	277	294
6	23	40	57	74	91	108	125	142	159	176	193	210	227	244	261	278	295
7	24	41	58	75	92	109	126	143	160	177	194	211	228	245	262	279	296
8	25	42	59	76	93	110	127	144	161	178	195	212	229	246	263	280	297
9	26	43	60	77	94	111	128	145	162	179	196	213	230	247	264	281	298
10	27	44	61	78	95	112	129	146	163	180	197	214	231	248	265	282	299
11	28	45	62	79	96	113	130	147	164	181	198	215	232	249	266	283	300
12	29	46	63	80	97	114	131	148	165	182	199	216	233	250	267	284	301
13	30	47	64	81	98	115	132	149	166	183	200	217	234	251	268	285	302
14	31	48	65	82	99	116	133	150	167	184	201	218	235	252	269	286	303
15	32	49	66	83	100	117	134	151	168	185	202	219	236	253	270	287	304
16	33	50	67	84	101	118	135	152	169	186	203	220	237	254	271	288	305
17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306

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SUBSCRIPTIONS to PMM are free if you are 1) management, engineering or purchasing personnel in a plant that 2) produces or uses precision metal molded parts. Just fill out this order card COMPLETELY and mail it.

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PMM Finishing Section

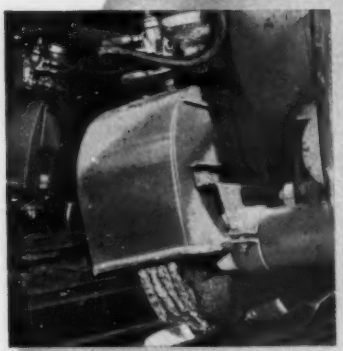
The specialized finishing methods, equipment and materials used to machine, assemble, surface condition or surface coat precision metal molded parts are presented here. This includes all secondary operations which convert a raw casting to a finished product.

Trimming and light machining are standard foundry operations

see pages 51 & 53

IN ALL METAL FINISHING...

YOU GET MORE BUFF MILEAGE WITH *Liquimatic*®



It's Automatic...It's Liquid... Fast Cutting, Easy Cleaning

On any buffing job, from heavy cuts to extremely high color, Liquimatic saves the buff, does cleaner work, faster. Liquimatic harnesses the heading-up properties of your buffs. The compound does the work, *not* the buff. Buffs last up to 200% longer!

Liquid compound is applied automatically; there's no time lost replacing bars by hand. You save compound, get the exact amount—metered for the job, plus exactly controlled viscosity.

Liquimatic saves maintenance costs and time. There's no nubbin pile and disposal to worry about. It's water-soluble for easy, quick wash-down. Long-lived and non-settling, it stores well at all temperatures. High flash point means safety in use.

Check your production costs against all of the cost-saving features of Liquimatic. You'll find all of Liquimatic's advantages in a new folder. Write for it today. **Hanson-Van Winkle-Munning Company, Matawan, New Jersey. Offices in principal cities.**

GET A FREE "LIQUINALYSIS" RIGHT IN YOUR PLANT

An H-VW-M engineer will demonstrate the Liquimatic Automatic System, without obligation, right in your own buffing room. You can quickly learn how much you can save, if you are now using bar compounds . . . and how much H-VW-M Liquimatic compound will save over other liquid compounds.

If you require a special formula, you'll see how easy your needs can be analyzed, and how the exact compound can be prepared to meet any viscosity or consistency, to suit any application from heavy cut to extremely high color.

4628

H-VW-M

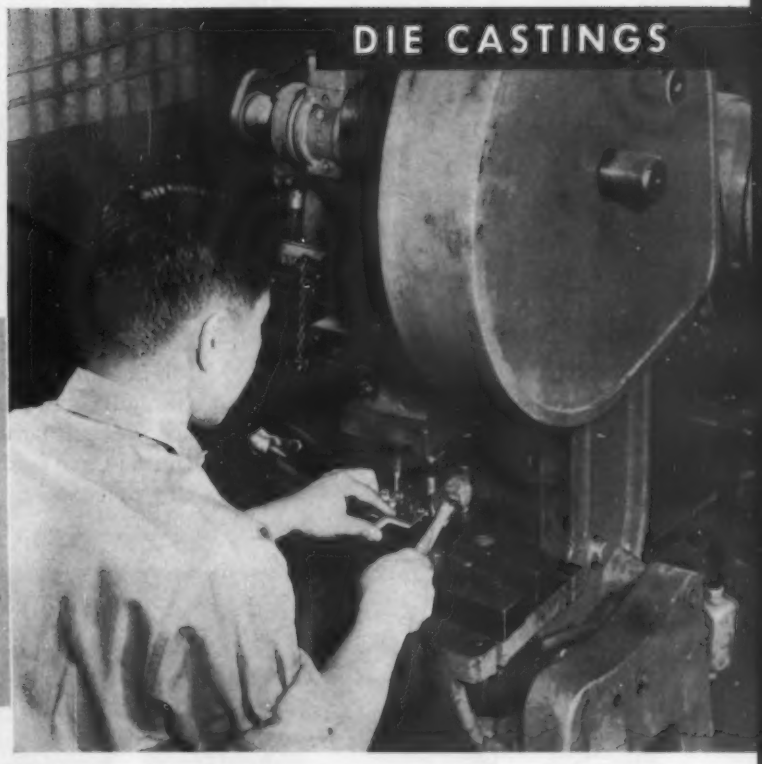
Industry's Workshop for the Finest in Plating, Anodizing, and Polishing Processes • Equipment • Supplies

PLATEMANSHIP—Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

For more information circle No. 61 on the Reader Service Card

THIS IS SAFE...

THIS ALSO IS SAFE



A Trim Press With Built In Safety

The Westland Die Casting Co., Los Angeles, Calif., produces zinc and aluminum die-cast parts for Revell Ho electric trains. Our story is that of a 15-ton punch press, used in a trimming operation, and its operator.

At Westland, management faced the problem of finding a press that would not perform its cycle before the operator could remove his hands from the die. This was important because the operator had to use both hands in placing the gate with a small mallet. There had to be an absolute guarantee that the press ram would not be tripped while the operator's hands were in the die.

Here was a design problem for the engineer. Needed was a press that offered ease and safety for the operator and yet provided speed and accuracy. The relatively new field human engineering has collected enough data to show that the operator must be taken into consideration in the design of equipment. The Kenco Electro-Safe Press is a result of engineering psychology.

The Kenco features a "dead" motor that eliminates loading hazards. It is impossible to trip the press ram while the operator's hands are in an open die. Except during the stroke the motor is "dead". The result is complete safety for the operator.

The press is operated with a 2-button control. One button is located on each side of the press away from the working area, (see figure). When both buttons are pushed simultaneously, the press completes a half cycle, from top to bottom of the stroke. Since both buttons must be pushed to operate the press, the operator's hands are out of the danger area. After the buttons are released, the press completes the cycle. The motor on this press rotates only during the cycle, and operates without a flywheel, or clutching mechanism.

The button system is of excellent design. Should the operator remove one hand during the down stroke the press will automatically stop. This is a savings feature. Castings that move or jump out of place can be saved.

Four Kenco units are in operation at the Westland plant. President Roy Melinder reports that the presses have given consistently satisfactory performance in producing, to date, nearly 2 million pieces.

HOW MANY WAYS CAN *Special Purpose Fasteners* CUT COSTS FOR YOU?

How many of your products employ laborious, old-fashioned fastening methods where simple fasteners could do the job and cut costs, too? How many parts and sub-assemblies can be adapted to include a self-fastening feature? How many future products could be improved by advance planning for fastener efficiency?

United-Carr's engineering staff offers you a wealth of experience in the design of special-purpose fasteners and self-fastening devices. Large-scale manufacturing facilities (including in-plant plastics molding equipment) ensure economical, *volume* production and prompt deliveries. United-Carr field representatives are ready to call on you at *your* request.

POLYETHYLENE MOUNTING FOOT

No mar, no scratch glide for use on TV receivers, record changers, small appliances, etc. Assembles into round hole in wood or metal cabinets.

NYLON SNAP-IN NUT

Snaps into square hole stamped out of sheet metal . . . provides secure anchorage for any sheet metal or self-tapping screw . . . highly effective electrical insulator.

QUICKEY FASTENER

Eliminates need for welding or swaging studs to sheet metal stampings, facilitates nesting, eliminates damage in transit because Quickey snaps in before final assembly.

THREAD CUTTING FASTENER

Re-usable, self-locking, vibration-proof fastener cuts clean, deep threads on unthreaded chrome-plated studs. Available for ⅛", 5/32" and ¼" studs.

PLUG BUTTONS

Snap into ⅛" to 3" dia. holes. Can be embossed with ornamental or functional designs . . . various finishes, shapes and sizes.

FISHTAIL RATCHET PLATE

Holds on smooth, die-cast metal or plastic studs to anchor name plates, trade marks etc. on appliances, automobiles, electronic apparatus, etc.

TRIMOUNT STUDS

Hold two or more thicknesses of material together. Easily installed by hand. Insure vibration proof attachment. Permanent or removable. Many shapes and sizes.

V-LOCK TEENUT

Re-usable, self-locking, one-piece, all-metal nut has high tensile strength, is unaffected by heat or oils. In various shapes, sizes and metals.

SOL-A-NUT

Self-locking, rustless, heat resistant. Sturdy, one-piece stainless steel construction prevents corrosion if nicked or scratched.

DURABLE DOT FASTENER

Snap fastener for cloth, leather, plastics and other materials. Positive closure, instant release. Black, nickel or brass finish.

CARR FASTENER COMPANY

Division of United-Carr Fastener Corp., Cambridge 42, Massachusetts

MAKERS OF DOT FASTENERS

For more information circle No. 65 on the Reader Service Card

High Speed Tapping

with one-way motor and reversing clutches.

USE of fractional horsepower "forward" and "reverse" clutches eliminate the need for a reversing motor and greatly increase the potential speed of tapping operations.

This makes it possible for an operator to slide a workpiece into a fixture on a tapping machine, press the "start" button, and watch the machine tap multiple holes to different depths, reverse, and back out the taps.

The unit is driven by a motor which runs continuously in one direction. This is the result of co-operation between the Ettco Tool Co., of Brooklyn, New York, manufacturers of the lead-screw tapping unit, and Warner Electric Brake and Clutch Co. of Beloit, Wisconsin.

The Ettco-Emrick automatic lead-screw unit is a self-contained, electrically controlled and actuated device developed for fast single or multiple-spindle tapping or threading.

Torque output of the clutches is varied by means of a rheostat. This provides the sensitivity needed for operating small taps, also provides the power required to drive large taps.

Because electric current, which is the actuating force, is the same as the magnetic flux used as the motive force, engagement and release of the clutches is instantaneous. They can be controlled to operate within milliseconds.

This eliminates end-pressure on the lead-screw or taps. As a result, threads are cut as accurately as the dies or taps used.

Clutches are operated as follows. The armature of the down-feed clutch is keyed to the continuously running drive shaft of the motor. The rotor is mounted on the lead-screw, and the stationary field is mounted on internal brackets.

On the reversing clutch, the armature is bearing-mounted on a sheave driven by a V-belt from a reversing idler-pulley. The rotor is keyed to the lead-screw, and the stationary field is mounted on a bracket.

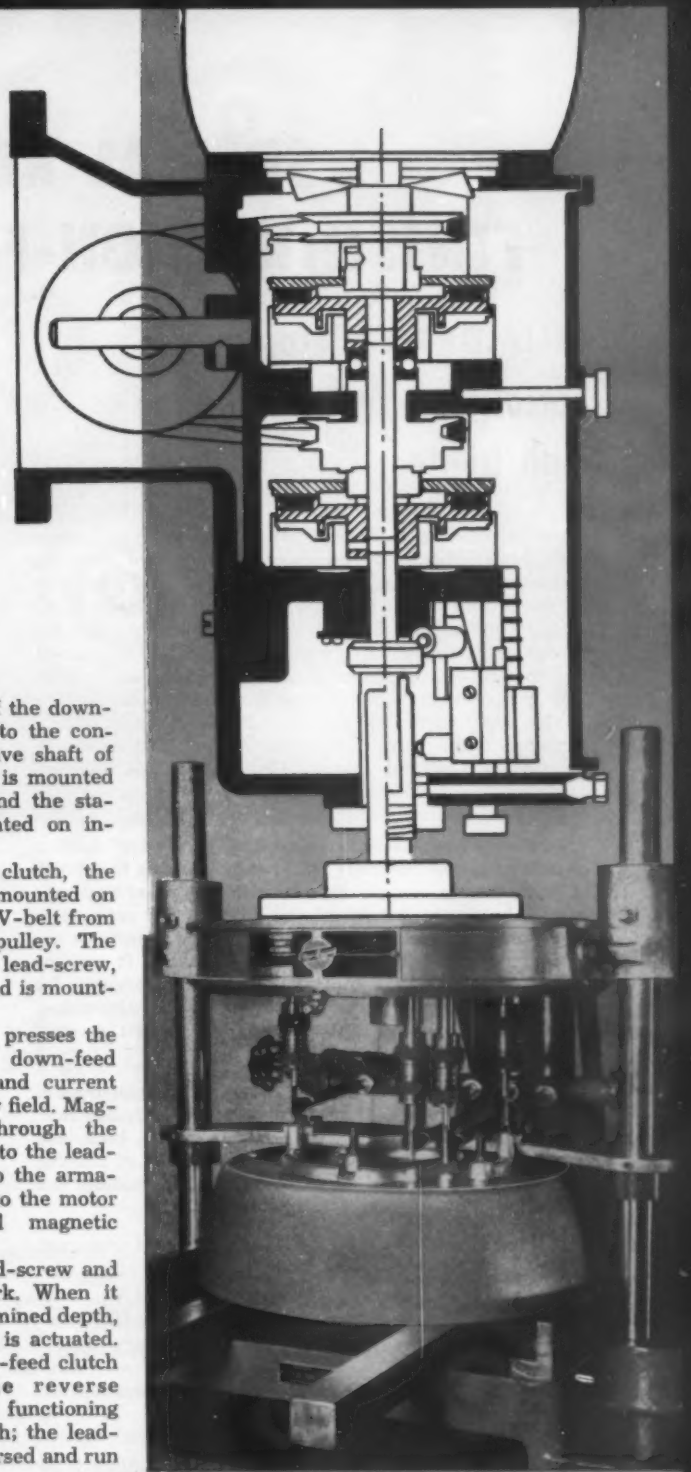
When the operator presses the "start" button, the down-feed clutch is energized and current flows in the stationary field. Magnetic flux passes through the rotor which is keyed to the lead-screw, and locks it to the armature which is keyed to the motor drive-shaft, in full magnetic couple.

This drives the lead-screw and tap through the work. When it reaches the pre-determined depth, a snap-acting switch is actuated. In this way the down-feed clutch is de-energized; the reverse clutch is energized, functioning as a down-feed clutch; the lead-screw and tap is reversed and run out of work.

Another snap-acting switch is actuated at the top of the lead-screw travel, and the reverse clutch is de-energized, ending the cycle.

The unit is flexible in operation because the torque output of the clutch is de-energized, ending the cycle.

The torque of the down-feed clutch can be set at a point where the clutch will slip if a tap sticks.



LEAD SCREW tapping unit with continuously running, one-directional motor. Taps four different-depth holes. Top shows electric clutches and depth control system.

At today's high labor charges, every effort must be made to increase the productivity per man-hour. Even the time required to stop, reverse and start a small motor can become an appreciable expense item when it is multiplied many thousands of times. This tapping head will help to lower waste time.

SPECIAL REPORTS ON FINISHING NON-FERROUS METALS

NUMBER I—Decorative, Corrosion-Resistant Finishing with Iridite

Chromate conversion coatings are well known and accepted throughout industry as an economical means of providing corrosion protection, a decorative finish or a good paint base for non-ferrous metals. However, continued developments are so rapid and widespread that many manufacturers may not be completely aware of the breadth of application of this type of finish. Hence, this digest of current information; to bring you up to date on the many ways in which you can combine salable appearance with durability in one finish at a competitive price advantage. Report II on paint base, corrosion-resistant finishes and Report III on chemically polished, corrosion-resistant finishes are available on request.

First, as a basis for this discussion, a "decorative" finish is considered as any chromate film that is used as a final finish in itself. It may be truly decorative in that its sole purpose is to enhance the beauty of the product. For example, a bright chrome-like finish or a pleasing bronze appearance are among the many effects that can be obtained. It may be functionally decorative in that it reduces reflectivity for camouflage purposes or provides a means of color-coding parts. But, in all cases, the Iridite films protect the metal against corrosive attack.

Iridite finishes are now available for all commercial forms of the more commonly used non-ferrous metals, including zinc, cadmium, aluminum, magnesium, silver, copper, brass and bronze. These films can produce a wide variety of pleasing appearances. The basic colors of the Iridite coatings are grouped below by metals.

ZINC and CADMIUM: Metallic bright, light iridescent, iridescent yellow, bronze, olive drab.

COPPER, BRASS, BRONZE: Metallic bright, yellow.

ALUMINUM ALLOYS: Clear, iridescent yellow, brown.

MAGNESIUM ALLOYS: Light brown, dark brown, black.

SILVER: Metallic bright.

In addition, many films can be modified by bleaching or by dyeing. Among the dye colors available are various shades of red, yellow, green, blue or black.

Depending upon the metal and the Iridite used, corrosion resistance of clear and bright films ranges from mild passivity to as high as 500 hours in salt-spray; on heavier dark films, salt-spray resistance ranges from approximately 100 to 1000 hours.

It is this combination of decorative and corrosion resistant properties that accounts for the widening use of Iridite finishes. For example, Iridites #4-73 and #4-75 (Cast-Zinc-Brite) make possible for the first time, a combination of lustrous chemical polishing of the as-cast surface of zinc die castings and good resistance to corrosion. Further, in many cases, sizeable savings in the cost of buffing and electroplating are realized.

On many steel parts, a simple system of zinc or cadmium plate and bright Iridite is used instead of more costly electroplated finishes to provide a bright, decorative and protective finish with tremendous savings in material, equipment and labor.

In finishing aluminum, where corrosion resistance or paint adherence is the prime consideration, the aircraft industry has all but abandoned the anodizing process in favor of recently developed chromate conversion coatings, among them Iridite #14 and #14-2 (Al-Coat). These formulations and their method of application can be varied to retain the original metallic appearance while providing acceptable corrosion resistance, or to produce a fully colored brown finish that offers exceptional corrosion protection. Again, time and manpower savings are astounding—one company saved at least $15,000 a year on maintenance of racks alone and another $40,000 on materials and labor in only nine months. In addition, of course, hundreds of thousands of dollars are saved by eliminating the need for expenditures for generators, heating equipment and racks.

Iridites are widely approved under both Armed Services and industrial specifications because of performance, low cost and savings of materials and equipment.

In planning or designing, you should consider the many other characteristics of Iridite finishes which may enter into the specific problem. In addition to having decorative and protective functions, these chromate coatings form an excellent base for organic finishes and bonding compounds. They have low electrical resistance. Some can be soldered and welded. The Iridite film itself does not affect the dimensional stability of close tolerance parts.

You can see then, that with the many factors to be considered, selection of the Iridite best suited to your product requires the services of a specialist. That's why Allied maintains a staff of competent Field Engineers—to help you select the Iridite to make your installation most efficient in improving the quality of your product. You'll find your Allied Field Engineer listed under "Plating Supplies" in your classified telephone book. Or, write direct and tell us your problem. Complete literature and data, as well as sample part processing, is available. Allied Research Products, Inc., 4004-06 E. Monument Street, Baltimore 5, Maryland.

WHAT IS IRIDITE®?

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a non-porous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

For more information circle No. 56 on the Reader Service Card

LOWER the inspection load and cut both rejects and extra operations by on-the-spot surface inspection, either at the machine (right) or at a single inspection center adjacent to machine areas (above).

A new instrument for...

Production Line Surface Inspection

MANUFACTURERS are discovering that considerable waste can be cut from the finishing operations by checking surface finish right at the machine, instead of in the inspection department. This practice eliminates the rejection of parts because of too coarse a finish. Equally important from the economic standpoint, it reduces another common loss — excessive finishing beyond the point necessary for proper functioning.

Many companies now use portable inspection equipment to check finish right at the machine, instead of the inspection department. They have found that, used in this way, portable finish inspection instruments are actually production tools. Their use makes it possible for the operator to set up his machine for proper tooling, speeds and feeds to produce optimum results. It also permits frequent quality checks during a production run, and thus provides prompt warning if the finish fails to meet specifications.

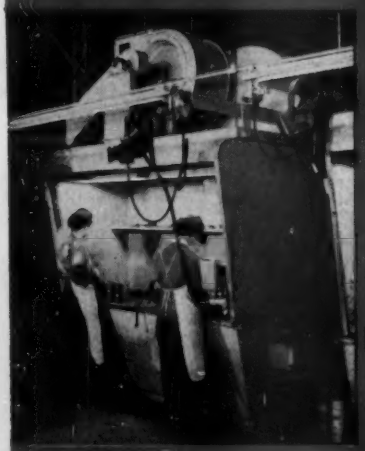
A portable instrument finding wide use is the Surfindicator manufactured by Brush Electronics Company, a division of Clevite Corporation, Cleveland, Ohio. It weighs only fifteen pounds and can be moved to any part of the plant, quickly and conveniently. It is used to measure surface roughness of metal, plastics, glass and vitreous ware, ceramics, paper and other materials.

Some users of this instrument have one at each production machine. Others place one in a spot convenient to each of a battery of machines, and operators bring a piece part to the instrument for testing. By locating the test instrument near the machines, the operator can make frequent finish checks without interrupting production.

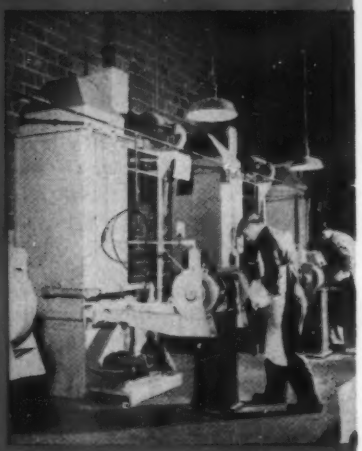
Because it is designed as a portable instrument that goes to the work, the indicator has been built to high standards of ruggedness and strength. Even though it is moved from place to place frequently, it will retain its accuracy and sensitivity. The dial is calibrated in terms of the new ASA specifications, and can be used on flat or curved surfaces, or to measure the internal finish of bores.

Proved Superior

for the safe collection of dust, fine chips and fumes when processing and finishing non-ferrous metals such as MAGNESIUM



PETERS-DALTON *Hydro-Whirl* WET TYPE DUST COLLECTORS



For the proper and safest method of collecting highly inflammable dusts, fine chips and grindings, the Wet Method is BEST. Peters-Dalton Hydro-Whirl Wet Type Dust Collectors are efficient in operation . . . low in price . . . and provide maximum safety to plant and personnel, particularly during what can be hazardous operations, such as grinding, polishing and buffing magnesium alloys.

Illustrated here are four types of PD Wet Type installations. *Upper left*—well ventilated bench for the safe collection of dust produced from portable tool and flexible shaft grinding, polishing and buffing; *upper right* — dust collector for grinding stands and polishing jacks; *lower left* — water-wash type spray booth for removing noxious fumes created while spraying oxidation inhibitors containing fluorides or other toxic compounds on cores; *lower right* — high velocity side hood wet collector for dust, fumes and smoke during a foundry "shakeout" operation.

Whatever your operation, PD engineers can design for you the proper type of Wet Dust Collecting Unit. We will be glad to tell you more—just write, wire or phone.

Now Available: Our informative new brochure for magnesium dust collection and control —

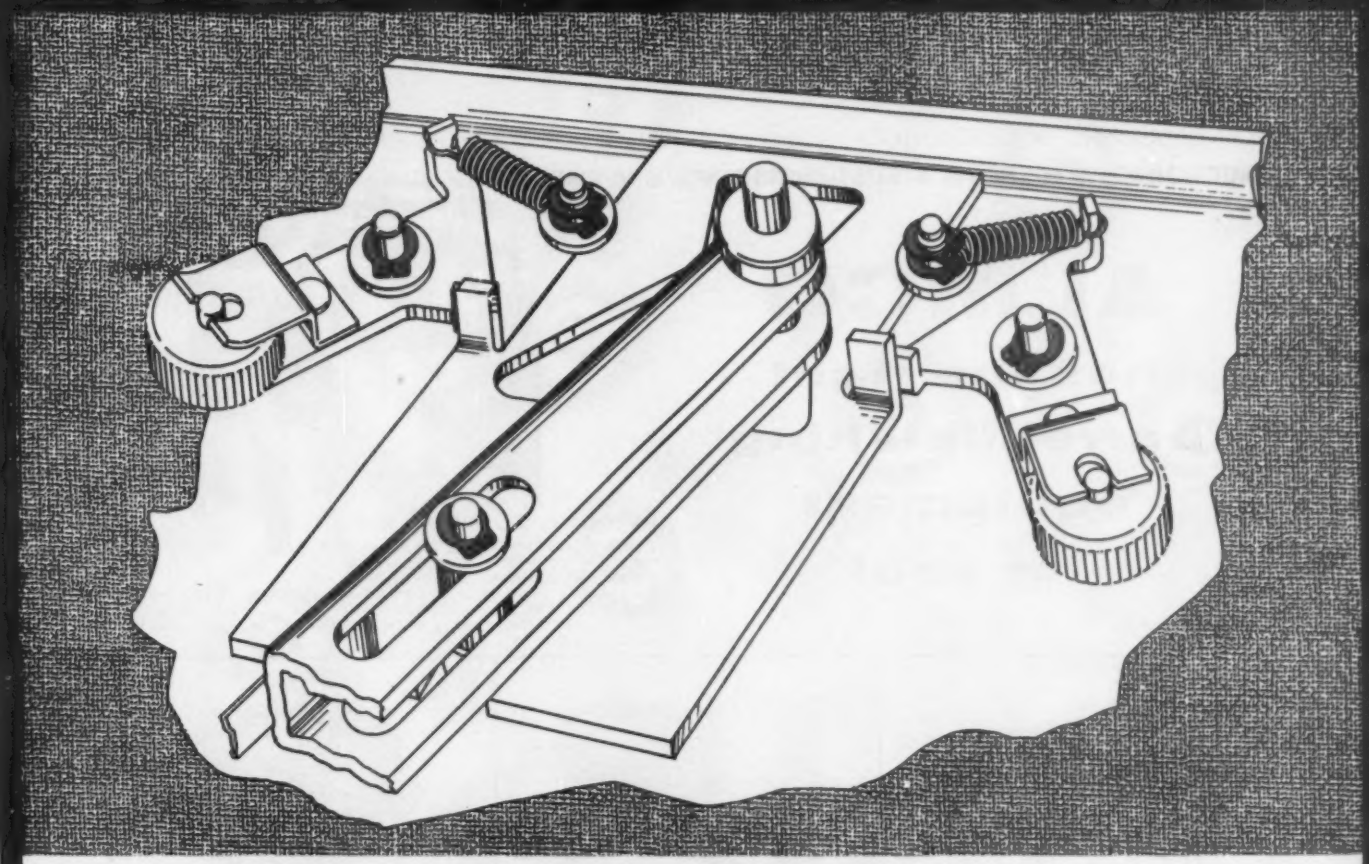
"Wet Method is BEST"

Representatives in principal cities.

- Hydro-Whirl Paint Spray Booths
- Industrial Washing Equipment
- Drying and Baking Ovens
- Hydro-Whirl Dust Collecting Systems

PD **Peters-Dalton INC.**
A SUBSIDIARY OF DETROIT HARVESTER CO.
17914 Ryan Road • Detroit 12, Michigan

For more information circle No. 84 on the Reader Service Card



Using Grip Rings In Assembly

Shortens Finishing Time

BECAUSE the use of grip-rings eliminates several costly machining operations, a tape recorder is now being manufactured with a base having molded studs to which component parts and sub-assemblies may be fastened quickly.

These studs are integral parts of a zinc die-cast base. The advantage of using rings is that machining operations are unnecessary to prepare the studs for fastening in place.

The components and sub-assemblies are attached to the die-cast base with series 5555 grip rings by Walds Kohinoor, Inc.

Rings Replace Nuts

These rings replace nuts together with a number of screws, cotter pins, and other methods of fastening. These various devices needed many expensive finish-machining operations including threading, drilling, and tapping before assembly.

Because the rings used in the stud-grip ring arrangement need no grooves, they exert a strong, frictional hold against axial displacement after assembly.

Need No Grooves

And since these rings need no grooves to make them functioning parts of the assembly, they may be seated at any point on the studs. This eliminates one of the most irritating factors found in designing small complicated assemblies and groups, the error that results from the steady accumulation of tolerances. As a result of their extreme flexibility in assembly, these rings give the assembler the opportunity to compensate for all the accumulated tolerances.

Typical of the ways in which the rings may be used to eliminate costly finishing operations, speed up production, and make the recorder a more efficient appliance are illustrated in the drawing seen above.

The assemblies seen there show how parts are secured to the molded studs of the zinc die casting, by means of grip rings and washers

Washers Installed

Because the washer is installed over the lever in a sliding-fit. critical tolerances would be necessary if a cotter pin or screw were used in place of the grip-ring.

The ring needs no locating device. It is seated over the washer at the most advantageous point on the stud. This compensates for any accumulated tolerances. In this way, many of the finishing problems of critical tolerances can be avoided and the number of rejected parts limited.

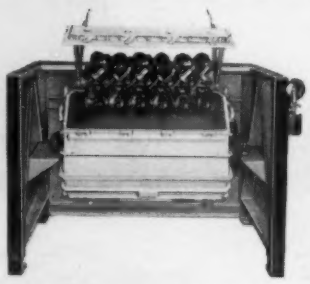
FOR DEBURRING • DESCALING • GRINDING • BURNISHING • POLISHING • FORMING RADII
MICROINCH FINISHING • RUST-INHIBITING • WORK-HARDENING

ALMCO

has the right barrel finishing equipment for you!

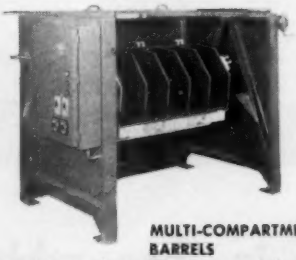
ALMCO'S "ADVANCED DESIGN" SERIES

Thirteen great models in this series! These machines feature a wide range of variable speeds (infinite from 6 to 30 r.p.m.), making possible economical deburring and finishing of the greatest variety of parts. Each unit has Almco's exclusive design feature and rugged construction to stand up under all types of punishing applications.



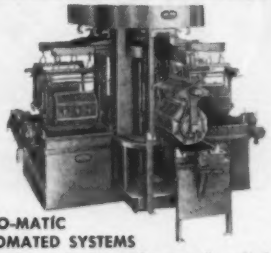
"FIXTURE" TYPE BARRELS

Pioneered by Almco for processing large and intricate parts. Custom designed fixtures hold parts securely, prevent part-on-part impingement and allow abrasive action to reach all surfaces, cavities, slots, etc. Barrels have automatic forward and reverse controls. Almco also offers integrated materials handling systems for further barrel finishing economies.



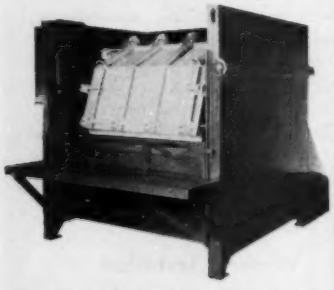
MULTI-COMPARTMENT BARRELS

Do you have these deburring and finishing problems — wide variety of parts or small quantity runs where fixtures would be too costly? Or short to medium cycle runs where you could *re-use* compound for several runs? Lack of floor space for several machines? An Almco custom-designed multi-compartment barrel may give you a cost-saving answer. Automatic forward and reverse. Any combination of compartments and doors.



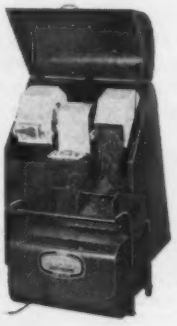
SUB-O-MATIC AUTOMATED SYSTEMS

Almco's exclusive submerged unit is an automatic, "assembly line" system for micro-precision deburring and finishing of small parts in quantity. Saves labor, speeds up processing and flow of high production parts. One man for example can operate this equipment and handle as many as 192 barrel loads per 16 hr. day. Slashes compound expense to minimum because compounds can be re-used for days at a time. These submerged systems can also be obtained in non-automated, straight line systems.



CUSTOM-DESIGNED BARRELS

Almco designs and manufactures special barrels of all types for problems where standard equipment cannot be effectively used. These range from the smallest type to the largest fixture barrel such as the 60" diameter x 60" length barrel shown above. Special large diameter barrels with double flat or triple flat doors are also available to accommodate extra large parts and to allow abrasive media to flow freely over the outer periphery of the part. Your special problems may be solved with one of Almco's custom-designed barrels. Material handling systems can also be closely coordinated with special barrels.



SMALLER MACHINES

Twin barrel machines manufactured by Almco are the standard of the industry for shops processing small lots of parts and for companies with large lots of small parts. Also ideal for sample processing, barrel finishing research and development work, and as auxiliary equipment. These units are Almco engineered to the highest specification standards and include operational and safety features found on larger Almco machines.

YOUR SAMPLE PARTS PROCESSED without obligation in this modern Almco test lab! Simply write on letterhead for address of nearest Almco lab or send parts direct to Albert Lea, Minn. Enclose specifications desired. Complete free report includes recommendation. 52 PAGE BARREL FINISHING HANDBOOK SENT ON REQUEST.

Almco deburring and finishing machines are ruggedly constructed to perform on a round-the-clock basis. They incorporate the best engineering design required in the industry — your assurance of versatility and economical processing of work parts. Optional equipment includes material handling devices and systems, automatic forword and reverse, double or triple flat doors, single and dual timer controls for automatic delay starting and stopping, perforated drain doors for flushing and rinsing, unloading devices, etc. Also a full and complete line of Almco Supersheen barrel finishing compounds and media of all types made especially for use with Almco precision barrel finishing equipment.

ALMCO

DIVISION OF QUEEN STOVE WORKS, INC.

78 Marshall Street • Albert Lea, Minnesota

Sales and Engineering Offices in Chicago, Detroit, Los Angeles, Newark, New Haven, Philadelphia and London, England.

Designers and Builders of all types of Barrel Finishing Equipment for the Metalworking Industry

For more information circle No. 57 on the Reader Service Card

NEW OFFICERS AT 3M

Election of Joseph C. Duke as executive vice president in charge of coated abrasives and adhesives and coatings and Bert S. Cross as executive vice president in charge of graphic products was announced by Minnesota Mining & Manufacturing Co. Duke and Cross were recently elected directors of 3M.

The company also announced the election of Dr. Byron J. Oakes as vice president of the chemical products group, and Cecil C. March as vice president of the coated abrasives and related products division.

KUHLMAN APPOINTS REPRESENTATIVE

The Ferdinand G. Schultz Company of Pittsburgh, Pa. has been appointed sales representative of Detroit Electric Furnace Division, Kuhlman Electric Company for Western Pennsylvania and the State of West Virginia. The addition of Detroit Rocking Electric Furnaces for metal melting supplements the Company's line of foundry equipment and supplies now being distributed.

Circle No. 80 on the Reader Service Card

GET AHEAD in Your SPRAY DECORATING with Conforming Matrix

ELECTRO-FORMED NICKEL OR COPPER MASKS

of all types for shielding and spraying highly intricate areas in single or multiple colors. Permit more shots between washings. Allow for reasonable dimensional differences in piece parts. Right hand tab masks free both hands for productive movements.

C-M

Conforming Matrix CORPORATION

346 Toledo Factories Building
Toledo 2, Ohio

NEW

Luster-on 52 POWDER

PROTECTS and BRIGHTENS ZINC at LOWEST COST YET

LUSTER-ON 52 POWDER *is a low, low priced single dip, no-leach conversion coating for zinc plated surfaces.*

LUSTER-ON 52 POWDER was recently developed by The Chemical Corporation for automatic equipment where facilities are not available for added leaching and rinsing.

LUSTER-ON 52 POWDER gives a bright bluish hue; provides lasting corrosion protection against staining, tarnishing and white powder products.

LUSTER-ON 52 POWDER can *now* be used in cases where cost has prohibited use of chromates in the past. For instance, electrical conduit, conduit boxes, screws and builder's hardware, tools, electronic parts, air conditioning parts, automotive parts, cheap toys.

LUSTER-ON 52 POWDER is not only low, low in price, but eliminates expensive handling, space-consuming storage and carboy deposits.

Still available, of course — time-tested Luster-On liquid dips and coatings for all your needs.

Data Sheets and Prices on Request. Send in part for free processing.

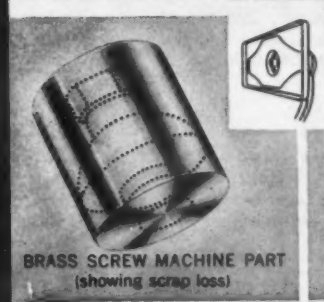
West Coast: Crown Chem. & Engr. Los Angeles & San Francisco
Canadian Licensee: Alloycraft Ltd. Montreal

THE Chemical CORPORATION

66 Waltham Ave. • Springfield 9, Mass.

Circle No. 58 on the Reader Service Card

MIRROR MAKER SAVES 66% with GRC die casting!



Roberk's rear-view mirror part die cast by Gries cost 1/3 of former brass screw machine part; eliminates expensive scrap loss.

Gries' exclusive methods produce finished parts in one high-speed automatic operation — without scrap loss and at low tool cost. Illustrated part is being made more uniformly, and at higher production rates as a zinc alloy die casting.

Quick deliveries on quantities of 100,000 to many millions.

NO MINIMUM SIZE! Maximum weight: ½ oz. Maximum length: 1¾"

Send today for bulletin

GRIES

GRIES REPRODUCER CORP.
World's Foremost Producer of Small Die Castings
157 Beechwood Ave., New Rochelle, N.Y. NEw Rochelle 3-8600

For more information circle No. 26 on the Reader Service Card

USEFUL LITERATURE, CATALOGS, MANUALS

any of these technical publications may be obtained by circling the appropriate numbers on the Reader Service Cards, Pages 48-49

PMM PROCESSES

Investment Castings:

Midwest Precision Casting Co. The second edition of "How To Design Precision Investment Castings" has been released by the company. This illustrated pocket-size book is written as a guide to metal working executives and design engineers who wish a file of both the benefits and limitations of the "lost wax investment casting process." New process information and case histories as well as basic design principles are discussed.

A copy of this free book may be obtained by writing, on company letterhead, directly to: Midwest Precision Casting Co., Dept PM1, 10703 Quincy Ave. Cleveland 6, Ohio.

Investment Castings: 155

Alloy Precision Castings Co. A series of brochures containing detailed case histories of successful investment casting applications. Subjects of "How To Design", "How To Specify" and "How To Buy" investment castings are covered.

Specialized Casting Facilities: 156

Grede Foundries, Inc., 4-page bulletin. Describes the company's facilities for handling any casting problem — whether it be ductile cast iron, gray iron, Shell Process, steel, or alloy castings. Descriptions and photos of their products are included.

Die Castings: 157

Doehler-Jarvis Div., National Lead Co., 6-page folder describing three recent product developments. Included is a chart on the advantages and limitations of eight most-specified alloys for die castings.

Casting Techniques: 158

Fabricast Div., General Motors, 16-page booklet. An illustrated description of how Die Casting, Permanent and Semi-Permanent Mold Casting, Investment Casting and Sand Casting techniques are employed by the company.

Foundry Facilities: 168

Hampden Brass & Aluminum Co., 20-page brochure. This illustrated and informative brochure describes the operation, organization and facilities of the company. Special attention is given to the products of the various company divisions.

Permanent Mold Iron: 171

Eaton Manufacturing Co., Foundry Div., 8-page brochure. New uses for Eaton Permanent Mold Iron are suggested in this illustrated technical brochure. Through the use of charts, photographs and drawings, the machinability, tensile properties and hardness, heat-treatability, and density are discussed.

Chrome & Nickel Steel Castings: 181

The Eastern Malleable Iron Co. A leaflet describes the applications of 8-grades of high chrome and nickel steel alloys. A chart listing the physical properties is included with a photograph of some of the company's castings.

MATERIALS AND EQUIPMENT

Pusher Furnaces: 159

Ipsen Industries, Inc., 2-page technical bulletin. P-57 describes standard, controlled atmosphere, multi-zone pusher furnaces for carburizing, carbo-nitriding, and general heat treating applications up to 1850 F. The 100% forced convection heating principle utilized by the equipment is explained.

Powder Metallurgy Test Service: 162

Hoeganaes Sponge Iron Corp. Form 108 presents a new production testing service available to producers of powdered metal parts. Detailed information on all steps of this free service is presented.

Cylinders, Valves, and Controls: 163

A. K. Allen Co., 60-page illustrated brochure. Complete drawings, specifications, and illustrations of the company's line of compressed-air cylinders, valves, and controls is presented. An introduction showing the uses of compressed air is included.

Sponge Iron Powder: 164

Hoeganaes Sponge Iron Corp., 4-page bulletin. Bulletin 109 describes Ancor MH-100 which was formerly identified as the Blue Line. Included are typical chemical analysis, screen analysis, and compressibility and strength data.

Battery-operated Vacuum Gauge: 165

Consolidated Electrodynamics Corp. Bulletin No. 9-1 describes an inexpensive, single-station, panel-mounted thermocuple vacuum gauge. The gauge operates on two size "D" flashlight batteries contained within its housing.

Cracking Hazard Elimination: 166

The Carpenter Steel Co., 8-page brochure. Discusses means of eliminating cracking hazards in the manufacture of tools and dies. Detailed information on design, how to make the tool, heat treatment and selecting the steel is included. Closeup photographs are used to illustrate crack of various kinds.

Continued on page 63

Before you buy a Die-Casting Machine...

SEND FOR THIS NEW BROCHURE

IT DESCRIBES THE LATEST AND BEST DEVELOPMENTS IN DIE-CASTING EQUIPMENT

B & T MACHINERY COMPANY

BUSS

201-217 W. EIGHTH ST. TELEPHONE EX-2-2341 HOLLAND, MICHIGAN

AFFILIATE OF BUSS MACHINE WORKS — MANUFACTURERS OF MACHINERY SINCE 1862

For more information circle No. 9 on the Reader Service Card

With Norton barrel-finishing abrasives and methods

Manufacturer Saved Over $90,000 First Year

A prominent aircraft parts manufacturing company reports the following savings — typical of very many — gained by shifting from hand-finishing to Norton TUMBLEX* abrasives and barrel-tumbling techniques:

Number of Parts	Cost of Hand-Finishing	Cost of Barrel-Finishing	SAVINGS
312,906	$.1149	$.0207	$29,475.75
30,724	.091	.013	2,692.42
25,599	.114	.014	2,559.90
25,685	.100	.012	2,260.28
9,347	.103	.020	770.50

Total savings for all parts — including many more made by this single company — amounted to well over $90,000 the first year and is increasing steadily.

This is just one example of the amazing economy forward-looking firms are chalking up by converting to the know-how and materials Norton offers to all industry.

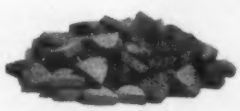
Your own metal parts can range from tiny needles to hefty forgings. They may be simple or complicated, hard metals or soft. Whatever they require, deburring, descaling or finishing to close tolerances — here's what you need to cut these operations to lowest cost.

Thorough knowledge of the right size, type and shape of tumbling abrasives to use, and just how to use them.

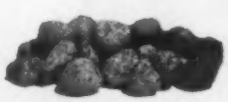
You can get these "Touch of Gold" advantages from Norton. Just send sample parts to our Sample Processing Department and you'll be forwarded finished parts with complete facts as to abrasives, methods and equipment. Or write for further information to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.

G-327

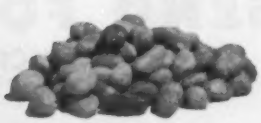
ALUNDUM* TUMBLEX "S". Bonded spheres that get into areas where other shapes can't reach. Exceptionally dense and long lasting. Five sizes.



ALUNDUM TUMBLEX "T". Bonded, triangular and fast-cutting for special shaped parts. They won't wedge in work slots or holes. Four sizes.



ALUNDUM TUMBLEX "A". For general barrel-finishing. Removes flash, scale, tool marks and burrs, while forming radii and finishes to required microinches. Twelve sizes.



TUMBLEX "N". Natural stones, exclusively Norton. For high lustre, especially on die castings and soft metal. Rounded shape brings up highest lustre. Seven sizes.

NORTON
ABRASIVES

Making better products . . . to make your products better

NORTON PRODUCTS:
Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING DIVISION:
Coated Abrasives • Sharpening Stones • Behr-cat Tapes

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

For more information circle No. 62 on the Reader Service Card

USEFUL LITERATURE

continued from page 60

Alloy Casting Institute Data Sheets: **167**
Alloy Casting Institute. The long awaited data sheets giving the most up-to-date property information available on the heat resistant cast high alloys has just been published in an attractive file folder. General feature of the new data sheets is a listing of room temperature and elevated temperature properties of each of the cast heat resistant alloy grades. Discussion of the applications, design and fabricating characteristics of each alloy is included.

Dust and Fume Eliminator: **169**
Schmieg Industries, Inc., 8-page illustrated brochure. Describes a new low price vertical rotor dust and fume eliminator with the high efficiency wet method collector. Bulletin VRU-4-57 gives complete data and design features.

High Vacuum Valves: **170**
NRC Equipment Corp., 32-page engineering manual. Describes and illustrates a comprehensive line of high vacuum valves. The requirements imposed by high vacuum service which are often combined with severe corrosion conditions, high temperature, vibration and other severe mechanical stresses are discussed.

Single Burner Furnaces: **172**
Campbell-Hausfeld Co., 4-page brochure. Single burner stationary crucible furnaces for brass, bronze and aluminum are presented. Complete detailed information on the company's line of furnaces is included.

Gates & Risers: **173**
R. Lavin & Sons, Inc., 8-page technical report. The fundamentals for a better understanding of the directional solidification that is required for the making of sound castings in tin bronzes and red brasses is presented, complete with drawings and photographs. The new Lavin brass ingot is also introduced.

Metal Patterns: **177**
City Pattern & Foundry Co., Inc., 6-page brochure. Describes the facilities for the production of metal patterns, shell mold patterns, permanent molds and the non-ferrous castings facilities available at the company. Information on wood patterns and aluminum, brass and bronze castings (pattern, experimental and production) is included.

Plaster Molds: **178**
United States Gypsum Co., Industrial Sales Div. A series of bulletins on subjects including metal casting plasters, gypsum cement molds for plastic patterns, tooling with gypsum plasters for reinforced plastics, techniques for making die sinking patterns and other industrial tooling models and molds. Pictures, statistics, applications, methods, uses, etc. are included in reference book.

Plastic Fixture Material: **179**
Devcon Corporation, 10-page illustrated brochure. The many uses of a plastic fixing material are described. One use of Devcon is in the making of drill fixtures of the original form. It can be sawed, drilled, tapped, threaded, ground, etc., with conventional metal working equipment. Included are the uses and properties.

Continued on page 64

Do you need better ways to strip paint?

When tough finishes resist your present stripping methods, you may need help on some of these problems:

1 How to strip oil-base paints... synthetic enamels... alkali-resistant plastics... resin-base paints... japans... wrinkle finishes... nitrocellulose lacquers ...alkyds... phenolics... ureas.

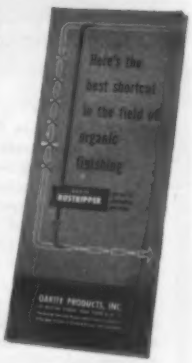
2 How to strip zinc chromate primers without etching aluminum.

3 How to strip paint from vertical surfaces and undersurfaces where thin-bodied strippers run off without doing their work.

4 How to strip metal parts that are too large to be soaked in tanks.

5 How to strip paint, pigment residues, phosphate coatings and rust in one operation.

6 How to strip paint from rejects, conveyor chains, racks and hooks in continuous operation.



Oakite has more than a dozen fine stripping materials for these and similar jobs.

FREE For information on problems 1, 2, 3 and 4 ask for a copy of "How to STRIP PAINT". For more on problems 5 and 6 ask for "Here's the best shortcut in the field of organic finishing". Write to Oakite Products, Inc., 34G Rector St., New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS · METHODS · SERVICE
SCIENCE

Export Division Cable Address: Oakite

Technical Service Representatives in Principal Cities of U. S. and Canada

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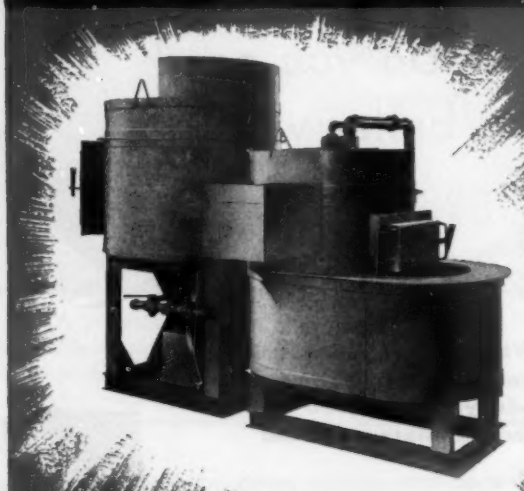
HERE'S ANOTHER NEW ONE!



Stroman "DC" Cylinder Type Furnaces for Combination Melting and Holding Aluminum with CONTAINED COMBUSTION BURNERS

For Die Casting, Permanent Mold and Sand Casting Operations

"Versatility Plus" is the keynote of these newest Stroman Contained Combustion Furnaces. They are absolutely new in design for they incorporate Contained Combustion Burners which eliminate direct flame impingement on the metal. They also make for cooler working conditions because of less heat loss. They give greater fuel economy for less BTU input is required . . . Longest refractory life and least maintenance due to mild combustion conditions . . . Uniform heating condition and improved metal temperature control assure lowest metal losses.

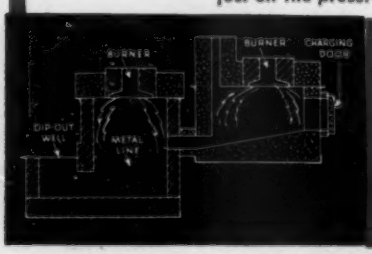
They are easy to charge and readily adaptable to automatic charging. Handling from 450 to 1600 lbs. per hour break down capacity with holding capacity from 600 to 2400 lbs., they will melt metal faster and more economically, and at the same time produce only the highest quality metal.

Roof of the furnaces are easily removed for furnace cleaning, relining, repair or burner service, as burner is mounted in the roof.

These Stroman "DC" Cylinder type furnaces are available in break down and holding combinations. However separate break down and holding units can be purchased. Break down units are often used to augment iron pot, electric and crucible furnace capacities.

Their flawless operation and ability to deliver years of trouble-free operation stamp them as a leading Stroman Aluminum production furnace. Investigate their cost cutting operation today.

Send for complete new catalogue No. 150 just off the press.



STROMAN
FURNACE & ENGINEERING CO.
FRANKLIN PARK
ILLINOIS

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USEFUL LITERATURE

continued from page 63

Cemented Carbides Characteristics: 180
Kennametal Inc., 22-page bulletin. Describes the nature, applications and manufacturing methods of Kennametal. Charts and pictures show the characteristics of the material in meeting specific tooling and wear-resistance applications.

Die Casting Alloys: 183
Samuel Greenfield Co., Inc. The chemical specifications and typical properties and characteristics of aluminum and zinc die casting alloys are given in a series of data charts in a handy pocket-size folder.

Inspection Systems: 184
Magnaflux Corporation, 14-page illustrated brochure. Explains the company's methods and equipment for the inspection of magnetic materials, nonmagnetic solids and inspection with Magnaglo and black light. Included are other inspection systems and equipment, manufactured by the company.

Pressure-Measuring Device: 185
Consolidated Electrodynamics Corp., 4-page brochure. Bulletin 1547A describes a precision pressure-measuring device for laboratory, field or automatic process control. Specifications, features and a price list are included on the company's Electromanometer which provides rapid, high-accuracy pressure measurements which are difficult to obtain with mercury manometers.

High-Vacuum Data & Specification Book: 186
Consolidated Electrodynamics Corp., Rochester Div. This 22-page illustrated book contains sections on high-vacuum metallizing equipment and high-vacuum furnaces as well as material on high-vacuum pumps, valves, baffles, traps, and stills. Charts, specification tables, and design information of interest are included.

Gamma Radiography Inspection: 187
Nuclear Systems, Div. of The Budd Co., 18-page booklet. The uses, sources and equipment of gamma radiography inspection systems are shown in an illustrated brochure. Construction, application, operation, specifications, and safety features of the equipment are included.

Extended Payment Plans: 189
Lester-Phoenix, Inc. A brochure describing the aspects of three extended payment plans for the purchase of the company's equipment. The plans are offered with examples and a work sheet outline for checking the over-all cost for a specific machine.

Furnaces: 190
Stroman Furnace & Engineering Co., 36-page catalog. Describes the history and organization of the company. Incluled is a complete, detailed, illustrated listing of the company's products. Specification charts and cut-away drawings are featured.

Shell Mold Testing: 191
General Electric Co., 4-page data sheet. Illustrated brochure, Foundry Facts #14, presents a standard collapsibility test for shell mold and core materials used with light metals. Included are the specifications and procedure for the test.

Automated Production Methods: 192
Planet Corporation, 16-page detailed brochure. Catalog 67A describes a number of engineered and automated handling systems. Illustrated are materials handling equipment for bulk and unit materials and automated and special handling machinery and foundry equipment. The company's engineering service is described.

Bellows: 197
Robertshaw-Fulton Controls Co. A new design and manufacturing system that reduces the length of metal bellows as much as 90 per cent, while retaining its original spring rate and stroke is described. The new bellows, "Formset", was developed to fill the need for precision metal bellows in miniaturized components and aircraft parts.

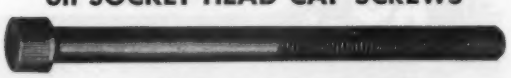
FINISHING

Spray Painting: 160
Eclipse Air Brush Co., 8-page booklet. Includes the spray painting of parts, sub-assemblies and complete products. It discusses various shapes and sizes which can be painted automatically.

Grinding Equipment: 161
Gardner Machine Co. Complete with illustrations, specifications, and data charts, the brochure presents the company's line of grinders and abrasives.

Continued on page 66

IMMEDIATE DELIVERY
on SOCKET HEAD CAP SCREWS



. . . Up to 12" Long!
on ½", ⅝" and ¾" Dia. Screws

and No Special "Set-Up Charges"

WHY HOLD UP YOUR WORK . . . for long deliveries on those so-called "special length" screws? You can get really fast service on high-quality Socket Head Cap Screws, Stripper Bolts and Dowel Pins . . . AND you don't have to pay special set-up charges either! D-M-E's large volume turn-over enables you to get in on the savings!

SO . . . Why Wait? . . . When you can get the Finest Quality, in Less Time, and at Less Cost to you!

. . . for 1 or 100!

In STOCK at ALL 7 D-M-E Branches

See Page 127 of your D-M-E Catalog . . . . or Write TODAY . . . . for complete information!

DETROIT MOLD ENGINEERING CO.
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BRANCHES IN:
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Los Angeles, Calif. – Toronto, Ont. – Dayton, Ohio

For more information circle No. 67 on the Reader Service Card

A DIE CASTING RECORD

Here's an adult record made by a vigorous teen-ager!

Nearly 19 years ago ADVANCE was asked to undertake the production of this bracket for an industrial and home-workshop tool manufacturer.

Since that time hundreds of thousands of these CERTIFIED Zinc Die Castings have been produced . . . and this husky teen-ager is still going strong!

For longevity in die construction and continuous production in die castings CONSULT ADVANCE!

ADVANCE operates under the CERTIFIED ZINC PLAN of The American Die Casting Institute.

37 years of service to industry

ADVANCE TOOL AND DIE CASTING CO.
3760 N. Holton St
Milwaukee 12, Wis.

For more information circle No. 2 on the Reader Service Card

Designed for Longer Life!

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REFAX® POTS

Tapering wall thickness of acf Refax Pots minimizes swelling and distortion melt after melt after melt... assures far longer life. For complete information on the full line of acf Refax Pots, Utility Castings, Ingot Molds and Goosenecks, write Dept. 8-I for illustrated bulletin.

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acf Industries, Incorporated

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Sales Offices: New York • Chicago • St. Louis • Cleveland • Washington • Philadelphia • San Francisco • Berwick, Pa. • Huntington, W. Va.

For more information circle No. 69 on the Reader Service Card

USEFUL LITERATURE

continued from page 65

Fasteners: 174

Shakeproof, Fastex, Div. of Illinois Tool Works. A 12-page illustrated catalog lists the types, sizes, strengths and tightening torques and hole sizes of thread-cutting screws and other fasteners manufctured by the company.

Inspection Systems: 175

Dayton X-Ray Co. A folder describes the three services of the company: industrial equipment and cusplies, industrial medical x-ray departments and custom non-destructive x-ray testing inspection service.

Fasteners: 176

Townsend Company. 4-page illustrated folder. Describes quick, secure, leakproof fasteners for metals and plastics. The advantages and specifications of the Tuff-Tite Fastener are included.

Inserts: 188

Rosan Inc. A 1-page illustrated leaflet describes a new self-tapping insert. "Inserto" features installation with a hex-bar. Other features include standard threads, manual or power installation, and resistance to high torque and tension loads.

Abrasive Chips: 193

Macklin Co. Abrasive chips and media for barrel finishing of ferrous and non-ferrous castings are described in a 4-page brochure. Recommendations for various production jobs are listed.

TAKES JUST 60 SECONDS TO TEST MOVING CHAIN CONVEYOR for OVERLOAD

WITH

DILLON Dynamometer

Now you can take frequent, accurate checks on conveyor chains and put a stop to costly breakdowns! No need to halt, break or loosen conveyors to attach this DILLON DYNAMOMETER. Utilizing a quickly positioned tensioning assembly at any check point, you install the DILLON DYNAMOMETER in 45 to 60 seconds while conveyor is moving. Remove it just as quickly and easily!

This is just ONE of more than 100 different ways in which the versatile DILLON DYNAMOMETER can serve in *your* plant. Capacities from as low as 500 lbs. up to as high as 100,000 lbs. Why not write today for profusely illustrated catalog in full color?

W. C. DILLON and CO., Inc.

14598AB Keswick St.
VAN NUYS 41, CALIF.
(Suburb of Los Angeles)

For more information circle No. 21 on the Reader Service Card

Finishing News: 194

Oakite Products, Inc., 60-page news service magazine. "Ultrasonic Cleaning" and "Hottest Thing In Aluminum . . . Napalm Bombs" are two of the feature articles in the magazine. A section on new products and developments and a list of the company's representatives are included.

Emulsion Cleaner: 195

Octagon Process, Inc. A new general purpose cold solvent emulsion metal cleaner for rapid, highly effective cleaning of both ferrous and non-ferrous metal parts is described in Sheet No. EC-563.

Barrel Finishing Compound: 196

Esbec Barrel Finishing Corp., detailed data sheet on Esbec No. 234. This new neutral, powdered, non-abrasive compound, which can replace acid compounds, eliminates the necessity for a subsequent neutralizing operation. A list of advantages and uses, with technical data, is included.

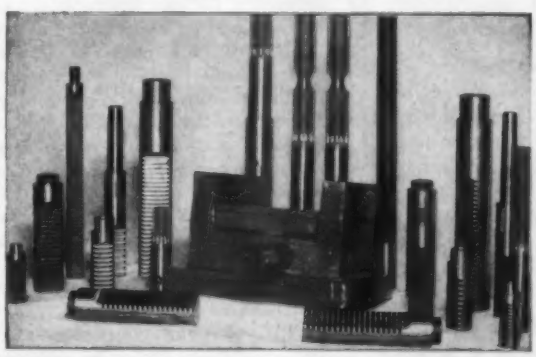
Hand Stoning: 198

Behr-Manning Co., 24-page illustrated handbook. Besides telling how better finishes can be obtained and cutting tool life increased, the booklet lists and describes the shapes, types and sizes available, either in natural stones or those manufactured in electric furnaces. It is of particular interest to tool and die makers, machinists, model builders and instrument makers.

Electro-Plating: 199

The Mitchell-Bradford Chemical Co. Complete information is available on four new products; Alkaline De Ruster #2, Quick Strip #8, Emulsion Cleaner #26 and Magic Dry. Included are data and descriptions on each of the products.

PEERLESS
"FLAME-A-LOY"*
PINIONS and RACKS
FOR DIE CASTING & PERMANENT MOLDS



Standardized To Mate and Interchange With Each Other For Longer Wear At Less Cost.

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Precision Products Since 1921

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For more information circle No. 43 on the Reader Service Card

So easy to convert to
ONE PIECE INVESTMENT CASTING...
with Production Savings
to **50%**

These pieces used in turbine flow meter work formerly fabricated of several components, now cast as an integral unit and used in the final assembly with a minimum of machining. 400 Stainless Steel.

Why? . . . because Investment Casting reduces tooling up . . . cuts down machining . . . conserves metal . . . eliminates assembly steps.

QUALITY CONTROL
Guaranteed work by virtue of complete inspection facilities: X-ray, Zyglo, Heat Treating etc.

Everywhere . . . Design Engineers are making the quick, easy, economical switch from other processes to Investment Casting.

More . . . Investment Cast parts need little finishing . . . thus cutting down on time . . . and Investment Casting Company . . . casts to close tolerances . . . accurate in every detail in the production of parts and components.

INVESTMENT CASTING CO.
60 BROWN AVENUE
SPRINGFIELD, N. J.

Write to dept. A.

On Request—Our brochure and other data to help you with your special casting problems.

For more information circle No. 34 on the Reader Service Card

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BRAND
HYDROLUBES

FLP

PROTECTION The fire-resistance of CARBIDE's fire-resistant hydraulic fluids has been proved by severe, exhaustive laboratory tests. And, in actual service, water-base UCON hydrolubes have prevented serious fires and injuries during more than 10 years of routine use in all types of industrial hydraulic equipment. The common fire hazards connected with hydraulic operations are eliminated when UCON hydrolubes are used. UCON hydrolubes are classified as acceptable, less hazardous fluids by Factory Mutual Laboratories.

ECONOMY UCON hydrolubes 150-CP and 275-CP are the economical answer to fire-resistance in hydraulic fluids. Most commercial hydraulic equipment can be easily converted to UCON hydrolubes with a minimum of time and expense. UCON hydrolubes have no harmful effects on most packings or seals. In fact, in many instances, reduced leakage losses have been reported. UCON hydrolubes also provide maximum protection against liquid and vapor phase corrosion and have outstanding anti-wear characteristics—thus, pump replacement costs are also held to a minimum.

Why not get all the facts on how UCON hydrolubes can mean protection plus economy for you. Write today for the booklet, "UCON Hydrolubes Spell Safety," F-40134.

UNION CARBIDE CHEMICALS COMPANY

Division of UNION CARBIDE Corporation

30 East 42nd Street, New York 17, N. Y.

"Ucon" is a registered trade-mark of UCC.

For more information circle No. 54 on the Reader Service Card

LETTERS

Continued from page 25

DIRECTORIES

Your April 1957 issue of PMM contains one of the most comprehensive reports that we have seen to date on the present status of powder metallurgy technology.

Review of this particular issue would be of special interest to a group of our System companies located abroad who do not have access to this magazine and who are actively engaged in die-casting manufacturing and are following powder metallurgy trends with potential interest.

We would greatly appreciate permission to purchase 8 copies of this issue for distribution to the managing directors at these locations.

Kindly direct all copies to the attention of the undersigned.—A.L., mfg. & tech. service.

As long as our supply of the directory issues lasts, we are glad to furnish copies to anyone who can use them.—Ed.

NEW READERS

I would appreciate receiving copies of the regular issues of your magazine for reference by the Value Analysts studying our product designs. Value Analysis has a responsibility for reviewing and recommending the most economical designs to achieve the functions necessary for our products.

Many castings, especially investment castings, are used in our aircraft accessories. The kinds of information contained in your magazine would be most helpful in keeping us up to date with industry advancements. There will be five people in our office using the magazine plus another five that will see it on an occasional basis. — R. G. W. value analyst

We are most happy to add men in positions such as future reader R.G.W. Anyone concerned with value analysis, design or purchasing of parts made by the six different processes covered editorially is qualified to receive PMM.—Ed.

HANSEN & CAUDILL JOIN NATIONAL RESEARCH

Recent staff appointments in the Research Division of National Research Corporation include John V. E. Hansen, Business Manager and James R. Caudell, Assistant Business Manager.

STAINLESS SINTERINGS

continued from page 43

To accomplish all of the desired actions, it is obvious that the hinge stud is one of the most critical parts of the assembly.

The properties required of the stud are, for the most part, opposed to each other. For proper functioning, the stud must be of relatively high strength material to be able to withstand the torsional stresses. It must, at the same time, be sufficiently ductile to permit fastening to the cam by staking operation. A third requirement is that the bushing must have sufficient wear resistance so that the nylon bearing will not cause undue wear, or be overly worn itself, during the life of the refrigerator. Finally, since the bushing must function in an atmosphere of fairly high relative humidity, it has to be of a material that will not rust.

A survey of materials and methods of manufacture dictated a stainless steel sintering and 18-8 type was selected.

Examination of the individual bushings in figure 1 shows why a sintering was selected by Kelvinator engineers. To machine the part from bar stock, the only other feasible method of manufacture, would be economically unsound due to the high scrap losses and to the excessive amount of machining that would be required.

When made as a sintering by the Amplex Division of Chrysler Corporation, the part presents no particularly difficult problems, provided the fabricator is skilled in the forming and sintering of stainless steel powder. Reasonably close tolerances are held on several dimensions, but since the piece is coined after sintering this close dimensional accuracy is feasible. As the bushing is now made, it represents the result of close cooperation between the designer and the fabricator.

Of primary importance to the average design engineer is the fact that stainless steel can be fabricated into a reasonably complex shape with dimensions held to closer than usual tolerances by powder metallurgical methods. While the bushing itself is of interest due to the unusual combination of properties required and because its shape represents a general type that is often considered impossible to make by powder metallurgy techniques, this is of somewhat less importance than the simple fact that such a part can be made economically.

To designers of some vision an entirely new field can be opened. Parts that are presently costing far too much to manufacture might be made more economically from stainless steel powder. Also, designs that had to be rejected or undesirably modified because of manufacturing costs or difficulties can well become possible when made as sinterings. The ability of the metal powder fabricator has advanced so greatly in the past few years that re-evaluation of manufacturing methods may disclose economies that only yesterday were impossible.

CAMPBELL PROMOTED BY NEW JERSEY ZINC

Robert L. Campbell has been appointed Manager, Metal Sales, Western Division, of The New Jersey Zinc Company. His headquarters will be at Chicago.

FAST — ACCURATE — ECONOMICAL
HYDRAULIC and MECHANICAL
BRIQUETTING PRESSES BY —
Haller
WRITE FOR DESIGN AND ENGINEERING DATA SHEETS.
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684 ANN ARBOR RD. • PLYMOUTH, MICH.

BOOKS

continued from page 28

allurgy; and 2) to study these manufacturing processes from an engineering viewpoint, including the metallurgical factors that control selection of suitable processes, and the influence of the processes on the final products.

Discussion of techniques and illustrations of industrial equipment is included. Attention is given to processes such as shell molding and special topics such as casting and metal working.

AN ENCYCLOPAEDIA OF THE IRON & STEEL INDUSTRY By A. K. Osborne, Philosophical Library, Inc., 15 East 40th Street, New York 16, N.Y. Price $25.00

This reference Encyclopaedia provides a concise description of the materials, plant, tools and processes used in the Iron and Steel Industry, and in those industries closely allied to it, from the preparation of the ore, down to the finished product; it defines the technical terms employed.

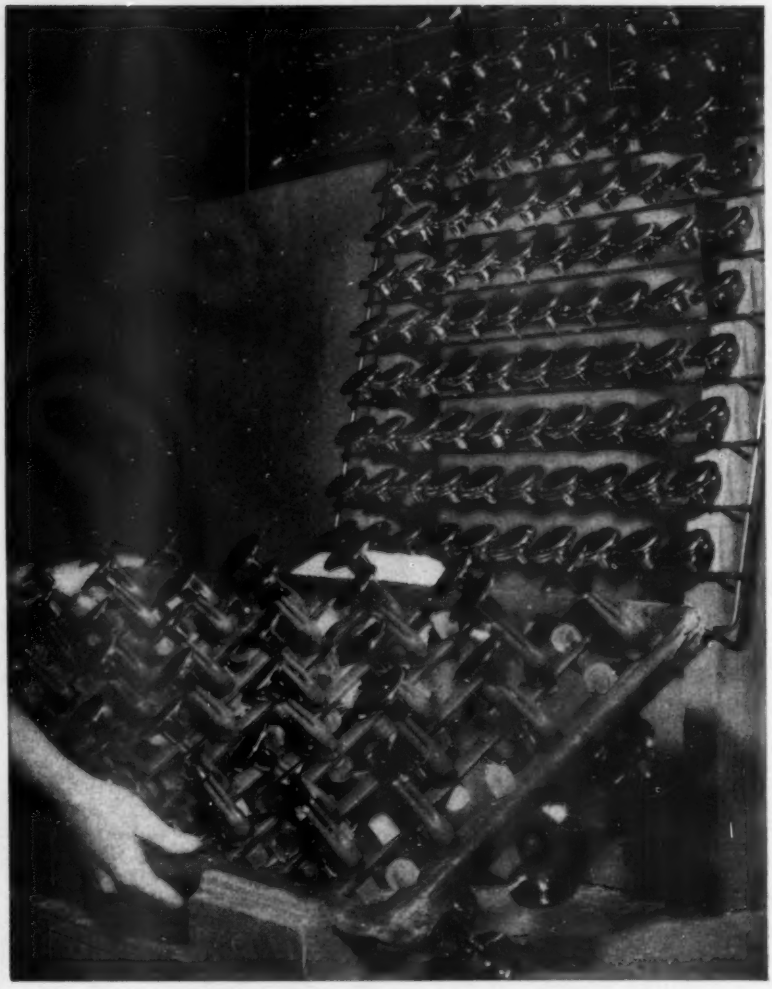
The work represents a recently revised presentation of material collected over more than a quarter of a century from American and European sources.

A HANDBOOK OF HARD METALS By W. Dawihl, Published 1956 by Philosophical Library, Inc., 15 East 40th Street, New York 16, N.Y. Price $10.00

After World War II the incomplete manuscript of Dr. Dawihl's book "Handbuch der Hartmetalle" was found and condensed into English. The book was made more effective by removing or condensing all information which is either well known in the industry or has been published in English.

The first part of the Book deals with the scientific principles of sintering in order to help provide an understanding of the production of hard metals in relation to other developments in the application of the sintering technique. The second part describes the technical production of hard metals.

Detailed reference is made to the experimental methods and the results of many other investigators.



FEDERATED ALLOYS FOR THE DIE CASTING INDUSTRY

DI-METAL . . .

a zinc base alloy of high purity, produced in three grades to meet all required mechanical properties.

ALUMINUM ALLOYS . . .

produced by Federated to conform to the ASTM, SAE, AMS, USN, Federal and AMS specifications.

Federated has 12 plants and 22 conveniently located sales offices which can give you expert assistance in choosing and applying a die-casting alloy; and which assure you of prompt delivery when you require it.

Federated products:

Aluminum, Babbitts, Brass, Die Casting Metals, Fluxes, Lead and Lead Products, Magnesium, Plating Materials, Solders, Type Metals, Zinc Dust

Four facts prove Federated's quality claims for Di-Metal Alloys

1. Only special, high-grade zinc, 99.99 percent pure, is used to make Federated Di-Metal.
2. The zinc is refined by American Smelting and Refining Company, which developed and perfected the strontium method of electrolytic production for the most accurate control of lead content.
3. Alloying ingredients are added in exact proportions under the direction of Federated metallurgists.
4. Spectrographic or quantometric testing, supported by chemical analysis, controls the quality of every melt. Not a pound of untested metal is shipped by Federated.

Federated field specialists work from 22 offices and 12 plants throughout the United States. One is always near by if you need emergency help.

Call your nearest Federated office. Ask for more information about our Di-Metals. It will pay you well to try them.

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120 Broadway • New York 5, N.Y.

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For more information circle No. 24 on the Reader Service Card

MACHINE TOOLS FOR METAL CUTTING, By W.H. Armstrong, McGraw-Hill Book Co., Inc., New York, N.Y. Price $5.00.

The necessary technical information about materials, tool, and processes in machine design, time study, production planning and control, and similar areas connected with manufacturing machine-shop products are covered.

In simple, understandable langauge, machine tools are listed and described, and the work they are used for is explained. After showing the relationship between the machine shop and the metalworking industry, the author classifies machine tools and lists the essential parts of a machine tool.

Definitions and other materials from *American Standard Preferred Limits and Fits for Cylindrical Parts* are presented and explained. There are descriptions of general-purpose metal-cutting machine tools. All illustrations show the latest equipment.

ARMY RESEARCH VOLUME GIVES SHELL MOLD TESTS

Army research into improved foundry control methods has brought refinements in techniques for tensile and transverse bend testing of shell molds and core sands. A report of the project has just been released for industry use through the Office of Technical Services, U. S., Department of Commerce.

The research was aimed at identifying and correcting the erratic behavior of sand specimens during test. Analysis of the tensile specimen and procedure indicated that the inconsistent values yielded by conventional test briquettes for shell molds and sand cores are caused largely by stress concentration attributable to the geometry of the specimen.

A new design was developed for tensile test briquettes which minimizes the concentration of stresses at the critical testing zone. A higher apparent tensile strength was demonstrated for all sands tested and reproducibility was improved for rammed resin and oil-bonded sands.

Report, PB 121-412 "Improvement of Sand Testing Techniques for Shell Mold and Core Sands," P. J. Ahearn, F. C. Quigley, and J. F. Wallace, Watertown Arsenal, U. S. Army, July 1956. U. S. Department of Commerce, Washington 25. 35 pages, price $1.

NEW PRODUCTS AND DEVELOPMENTS

Want complete details on these announcements? Use the Reader Service Cards. You'll find them facing page 16 of this issue

HIGH VACUUM FURNACE FOR 2200 C OPERATION

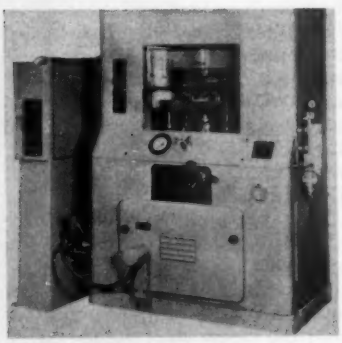
The vacuum Furnace Division of Richard D. Brew and Co., Inc has designed a high vacuum furnace for continuous operation at 2200 C, at pressures between .01 and .05 microns.

Designated as Model 420, the furnace features a heater shell assembly, which surrounds the heating element and work being treated, and is specially designed to provide a minimum impedance to the flow of gases emanating from the work charge. The new furnace for sintering, brazing, bright annealing and melting also features a tantalum heating element which is clamped on two sides to prevent sag and premature failure.

Included is a sight-tube, through which optical pyrometer readings can be made without raising the cover of the heater shell assembly.

Circle No. 205 on Reader Service Card.

AUTOMATIC COINING AND SIZING PRESS



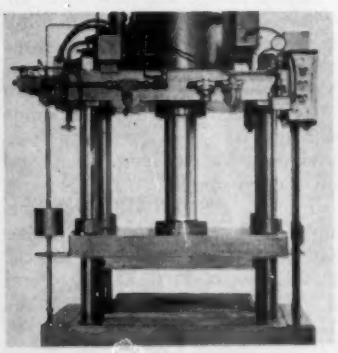
A new automatic coining and sizing press for metal powder parts up to 1-1½ inches high has been developed by Haller, Inc. The 40 ton press coins and sizes I.D. and O.D. and thickness of parts in two stages at each stroke of the press. A uniform density structure over the length of the part is achieved by a hydraulic pressure system.

Features include a one-shot central lubrication system and a combined air clutch and brake. Safety features built into the press include an automatic door lock and limit switches on all vital parts of the press and its important feeding mechanism.

The press can be adapted to coin and size an almost unlimited variety of metal powder parts, such as complex flanged step gears, straight and flanged bushings, etc., at a rate of nearly 1000 pieces an hour.

Circle No. 206 on Reader Service Card.

PRESS EQUIPMENT FOR DIE CASTING



A hydraulic press, which is considered to be the fastest on the market, has been developed by Kard Mfg., Inc.

The new press uses a new accumulator principle combined with a shock-free hydraulic system. As a result an extremely rapid cycling action is achieved with lower horsepower input. Speeds up to 2000 inches per minute ram travel provide broader production capacities in metal working and other industries.

The new 2600 press is available in capacities from 1 to 600 tons and it features a "C" frame and 2 and 4 post and gib design. Rigid in construction, the press requires a minimum of floor space.

A bulletin is available which lists the 15 presses manufactured by the company. An illustration and brief description of each type of press is included.

Circle No. 207 on Reader Service Card.

You get speedier service from the

ZINC ZONE

Central location of American Zinc plants assures prompt deliveries of slab zinc to any point in the nation.

HILLSBORO, ILL., PLANT
Prime Western, Brass Special, Intermediate, High Grade, Continuous Galvanizing Grades
MONSANTO, ILL., ELECTROLYTIC PLANT
Special High Grade, High Grade, Continuous Galvanizing Grades, Special Shapes
FORT SMITH, ARK., SMELTER
Prime Western, Brass Special
DUMAS, TEXAS, SMELTER
Prime Western, Brass Special, Continuous Galvanizing Grades

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
SULPHURIC ACID
LEAD-FREE and LEADED ZINC OXIDES
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For more information circle No. 27 on the Reader Service Card

another unique GRC die cast zinc alloy component

this movable Intercast® element unit was cast-assembled in one operation by GRC

GRC's unique, patented method die casts multiple-part zinc-alloy units INTERCAST with moving elements in a single, automatic, time-saving, money-saving operation . . . even continuously interlocked assemblies. Units are delivered ready for use.

This INTERCAST technique is an ingenious refinement of GRC's exclusive method of small parts die casting—providing broad design latitude, close tolerances, economies in quantities of 100,000 and more.

Let GRC solve your problems. No size to small! Maximum length 1¾", Maximum weight: ½ oz. Send for fact-filled bulletin, TODAY.

World's Foremost Producer of Small Die Castings

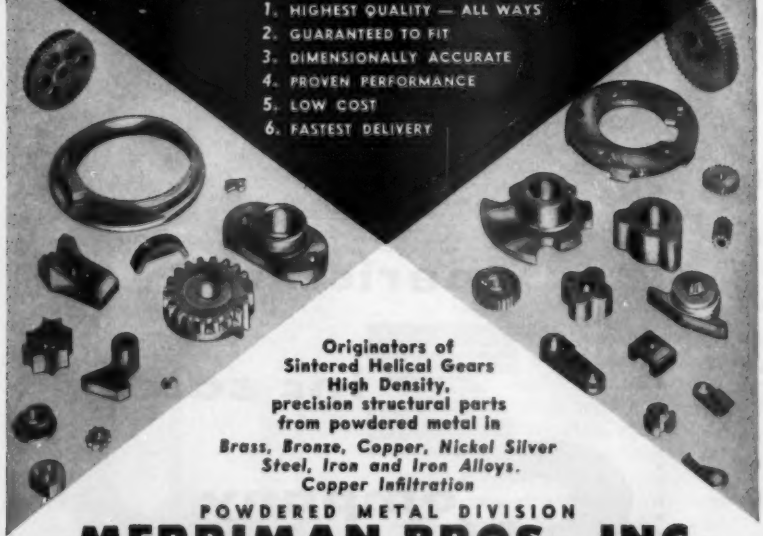
GRIES

GRIES REPRODUCER CORP.

157 Beechwood Avenue, New Rochelle, New York. NEw Rochelle 3-8600

6 GOOD REASONS Why You Should Specify MERRIMAN POWDERED METAL PARTS

1. HIGHEST QUALITY — ALL WAYS
2. GUARANTEED TO FIT
3. DIMENSIONALLY ACCURATE
4. PROVEN PERFORMANCE
5. LOW COST
6. FASTEST DELIVERY



Originators of Sintered Helical Gears High Density, precision structural parts from powdered metal in Brass, Bronze, Copper, Nickel Silver Steel, Iron and Iron Alloys. Copper Infiltration

POWDERED METAL DIVISION

MERRIMAN BROS., INC.

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1011 Main St. East Hartford, Conn.
4324 W. Florissant Ave. St. Louis, Missouri
3092 Livingston Rd. Cleveland, Ohio

For more information circle No. 38 on the Reader Service Card

MULTI-SPINDLE MACHINE

. . . for drilling & tapping

Designed for rapid adjustment of the spindles, the Starrett is suitable for both short and long runs. The spindles can be fixed in any position — circles, straight lines or irregularly — and can operate at different speed ranges. Automatic depth gauges are provided and a fool-proof device, electrically controlled, governs the operation. Tapping operations can be done with different pitches, and the accuracy of the reverse rotation of spindles enables the tapping of dead holes to very close tolerance. Other features according to the Aaron Machinery Co., Inc., include an all-gear transmission, case-hardened, tempered ground gears, automatic feed with 4 normal, 4 rapid speeds, and ball and roller bearings throughout.

Circle No. 208 on Reader Service Card.

PROTECTIVE PAPER

. . . preserves high finishes

Highly finished surfaces are protected against marring in fabrication, shipment or storage by an improved protective paper No. 190 developed by the Behr Manning Co.

Already tested, the new paper will adhere securely, yet can be removed easily after long periods in storage without stain or adhesive deposit. With tensile strength of 27 lb per inch of width in the machine direction, 9 lb in the cross direction, the paper has sufficient flexibility to permit its use on shaped parts.

Circle No. 209 on Reader Service Card.

ZINC ADDITIVE

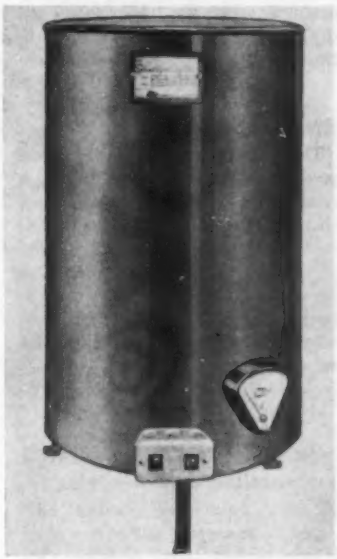
. . . for Plating Operations

The new additive for plating operations produces bright, fine-grained deposits on metal parts when introduced to a properly balanced bath. Produced by Wagner Bros., Inc. in the form of a light tan powder, but dissolved in water prior to use, the additive is a dual-purpose brightening agent that can be used for barrel and rack plating operations. Called Iso-Brite ZB 567 it can be employed with a liquid brightener, particularly in barrel plating stampings, or it can be used alone to produce a bright plate with good luster.

Circle No. 210 on Reader Service Card.

SOLVENT VAPOR DEGREASER

. . . available at low cost

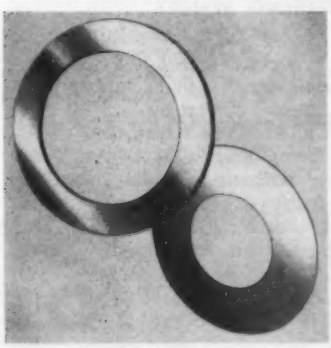


A small light weight solvent vapor degreaser is available for plant maintenance and small production. Described by Tect, Inc. as Model #10, the unit will clean a minimum of 100 lbs. of steel per hour in the clean vapors of non flammable Vythene, Perchlorethylene, or Trichlorethylene.

Circle No. 211 on Reader Service Card.

ELECTRICAL CONTACT RINGS

. . . of silver-nickel-graphite



Made of powdered metals and called Gibsiloy NC-205, the new ring material improves conductivity, and causes surer contact when used as washers. It affords low contact resistance yet will not gall despite heavy sliding action, the Gibson Electric Co. reports.

The rings will operate for long periods without galling.

Circle No. 212 on Reader Service Card.

DO YOU KNOW - AUTO-DIESEL PLUNGER RINGS Last MONTHS instead of HOURS have lasted OVER 122 DAYS..

It is hard to believe but Auto-Diesel Hardened Steel Plunger Rings last for MONTHS instead of HOURS—in fact they have lasted over 122 days. ***IN MANY PLANTS THEY HAVE GIVEN OVER 100,000 SHOTS PER SET.*** (Names supplied upon request). Maintenance and down-time are reduced to the minimum and die casting machines last longer. Made of cast iron, dieloy cast iron or hardened steel. Made especially for those who operate die casting machines or cast zinc parts.

Buy.. AUTO-DIESEL TWO or THREE PIECE PLUNGER SEGMENT RINGS at ATTRACTIVE PRICES

Delays cost money in many ways. We can supply QUALITY Auto-Diesel Two or Three Piece Plunger Segment Rings QUICKLY. We specialize in small runs and can sell at ATTRACTIVE prices. Made in sizes from 1½" to 4" by ⅞".

DETROIT Sales Rep. CLIFFORD-ROCKWELL CO.
19364 James Couzens Hwy.

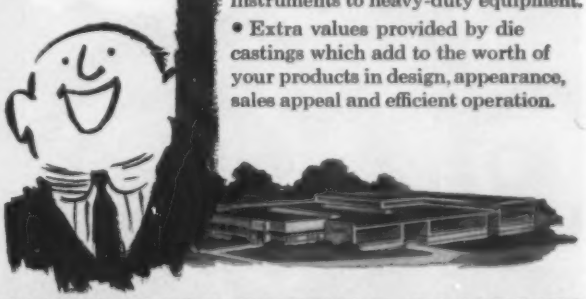
Write for Details

THE AUTO-DIESEL PISTON RING CO.
3135 Superior Avenue • Cleveland 14, Ohio
"RINGS and SHAPES Since 1921"

You Get EXTRA VALUES

— when you Specify DIE CASTINGS by MILWAUKEE

- Extra values provided by the modern Milwaukee plant with every facility for Complete Die Casting Service.
- Extra values provided by more than 45 years of continuous service to industry in producing precision die cast parts for all types of assemblies from small intricate instruments to heavy-duty equipment.
- Extra values provided by die castings which add to the worth of your products in design, appearance, sales appeal and efficient operation.



Milwaukee operates under the Certified Zinc Plan of the American Die Casting Institute.

MILWAUKEE DIE CASTING COMPANY
4146 N. HOLTON STREET • MILWAUKEE 12, WISCONSIN
Established 1909

NEW PRODUCTS—Continued

CHROMATE COATING

. . . for producing iridescent films

Conversion Chemical Corp's Kenvert No. 18 is a new powdered chromate coating for producing iridescent films on zinc, cadmium, copper, brass and zinc die castings. The product can be adjusted to give varying iridescent bronze shades. Corrosion protection is ample to meet all Government specifications.

The product maintains readily on long usage and gives very bright undertones on both zinc and cadmium plated work.

Circle No. 213 on Reader Service Card.

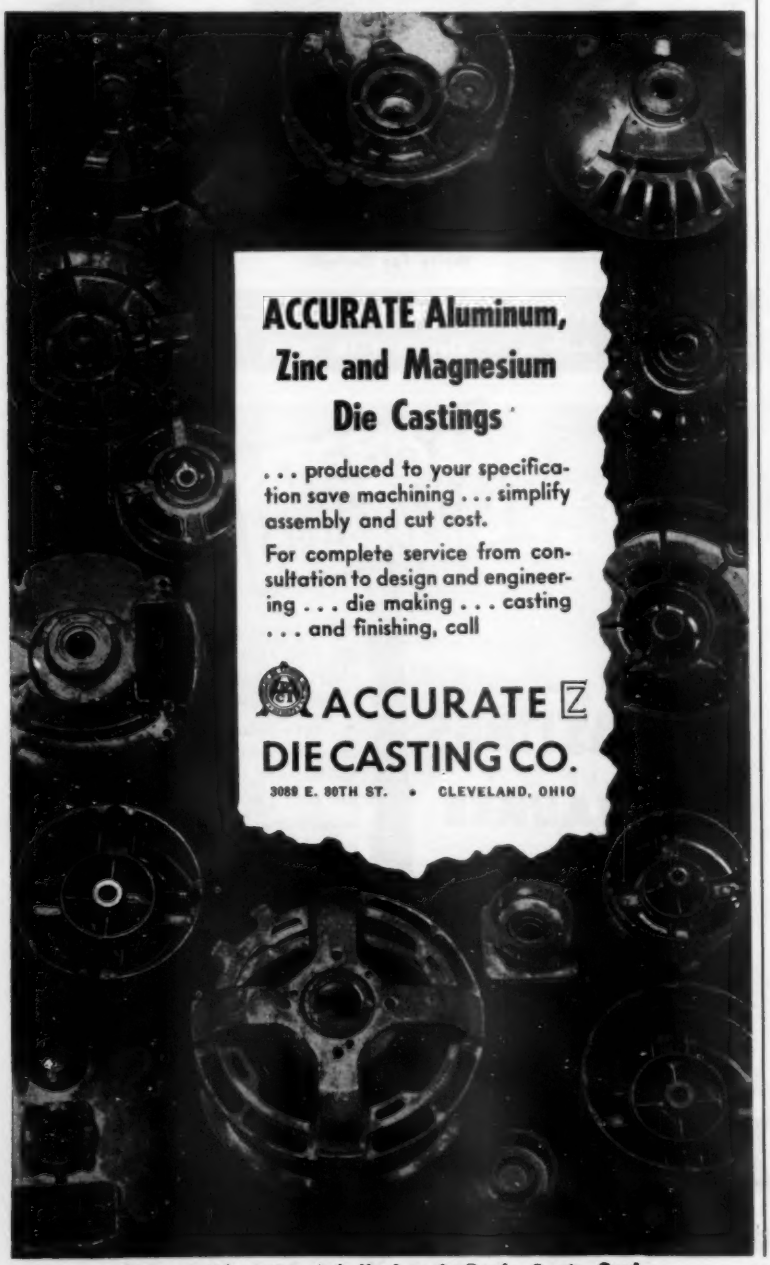
GEL COATING

. . . is superior to dry powder

Called Cera-Coat, a gel coating is designed for crucibles, ladles, skimmers. ingot molds etc. The coating has sufficient elasticity to successfully withstand contractions and expansions caused by severe temperature variations, according to the Michael Scott Co. Mixed in a matter of seconds, the gel can be brushed or sprayed on.

Any metal which may solidify on the coating may be peeled off without difficulty.

Circle No. 214 on Reader Service Card.


ACCURATE Aluminum, Zinc and Magnesium Die Castings
. . . produced to your specification save machining . . . simplify assembly and cut cost.
For complete service from consultation to design and engineering . . . die making . . . casting . . . and finishing, call
ACCURATE
DIE CASTING CO.
3089 E. 80TH ST. • CLEVELAND, OHIO

PENETRATING OIL

"Dependable" is the name given by the W. J. Ruscoe Co. to a penetrating oil that comes in a self spray can. Handy and convenient, the Aerosol dispenser applies a strong stream to the "hard to get" places with bull's-eye accuracy. Additives provide exceptional effectiveness on moist and damp areas.

Circle No. 215 on Reader Service Card.

CHROME PLATED STRIPPING

. . . possible by immersion

A dry acid replacement salt makes immersion stripping of chrome plated parts possible. M-629 was originally developed by Mac Dermid, Inc. to replace liquid acids in neutralizing and activating acid dips in plating operations.

As a chrome stripper, it leaves the nickel underplate bright, lustrous and free of smut and oxide discoloration. After careful rinsing and replating, parts show no whiteness or streaks and the quality of the replate is said to equal the original plating. M-629 is used in a solution of 1 lb./gal. heated to 180-190 F.

Circle No. 216 on Reader Service Card.

BUFFING WHEEL

. . . for soft materials

A buffing wheel, for soft materials, consists of 17 rubber pads of special design.

Called Kwik Kleen, the wheel is completely safe and can be used without a shield. Long life is featured without surface burning, scorching or scratching. The wheel, manufactured by James Black & Associates, is 4½ inches in diameter and 1½ inches wide.

Circle No. 217 on Reader Service Card.

NICKEL STRIPPER

. . . for die castings

A new nickel stripper, developed by United Chemical Corp. of New England, Ni-Plex, is effective for all types of die castings and for parts containing two or more different base metals. It does not pit or corrode the basis metal.

The stripper contains no cyanide, caustic or acid, does not

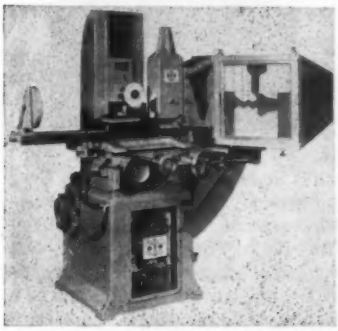
For more information circle No. 1 on the Reader Service Card

fume, and is stable over long periods of time at elevated temperatures. It enables electroplaters to maintain one stripping bath in continuous operation for the removal of nickel from all basis metals used.

Circle No. 218 on Reader Service Card.

VISUAL GRINDER

. . . provides closer tolerance



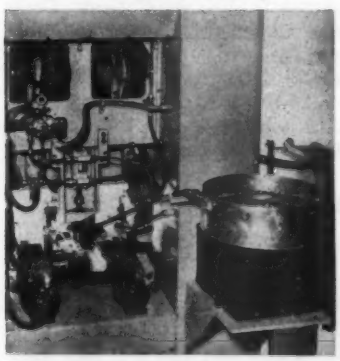
The new model VG-3 Visual Grind features a continuous lubricating system, timer belt, 110 volt electrical control, and closer tolerance downfeed control among other new improvements.

Visual Grind, made by The Cleveland Grinding Machine Co., enables the form grinding of steel and tungsten carbide to precision tolerances without stopping to consult a comparator. The improvements facilitate continuous grinding and work inspection of intricate forms by through, blind and combination grinding methods. This is accomplished by projection of the work-piece on a ground glass viewing screen with magnification systems ranging from 10:1 to 100:1. The work-piece is ground and simultaneously inspected.

Circle No. 219 on Reader Service Card.

HYDRAULIC PRESSURE SYSTEM

. . . increases accuracy



The new hydraulic pressure system on Haller, Inc. presses simplifies and controls pressing to density powdered metal and ceramic parts. Represented by a compact side mounted unit, the system consists of an oil filled accumulator which is charged to 100 psi with Nitrogen, a sandwich type check valve, and a relief valve. Features include a knurled screw with a lock nut for quick and sensitive pressure regulation and a pressure gauge with maximum read hand to indicate, in psi, the pressure used in the cylinder at each stroke.

Circle No. 220 on Reader Service Card.

ALUMINUM BRONZE ALLOY

. . . contains manganese

A combination of high mechanical properties and superior casting characteristics is claimed. Composition includes aluminum, 2 percent nickel, and 3 percent iron.

Information may be obtained from the American Brake Shoe Co., National Bearing Division, Ampco Metal, Inc.

Circle No. 221 on Reader Service Card.

Continued on page 64

MASTER DIE MODELS and DUPLICATING MODELS . . .

50 SKILLED CRAFTSMEN . . .

working in* WOOD, METAL, PLASTER and PLASTICS, *solve pattern and model problems for all industries . . . from design to finished assembly.

- **MASTER DIE MODELS** for die cast parts, built to Vernier Height Gage Accuracy.
- **DUPLICATING MODELS** for all types of duplicating equipment.
- **MASTER DIE MODELS** for stamped parts—for largest presses.
- **PRODUCTION PATTERN EQUIPMENT.**
- **FIXTURES and GAGES,** for dimensional checking of production castings and stampings.
- **COMPLETE PROTOTYPE SERVICE,** from design to finished prototype assembly.
- **VACUUM-FORMING DIES and EQUIPMENT.**
- **PRODUCTION PLASTIC MOLDING** — transfer and compression.
- **PRODUCTION PLASTIC EXTRUSION.**
- **DESIGN SERVICES.**

ERLER

PATTERN & MODEL CORP.

4 EAST LASKEY ROAD, TOLEDO 12, OHIO

TELEPHONE: KLONDIKE 4691

For more information circle No. 22 on the Reader Service Card

McDONALD WINS DOW AWARD

John C. McDonald, assistant technical director of The Dow Chemical Company's Magnesium Department, received the annual Willard H. Dow Memorial Award for Research in Magnesium.

McDonald was cited for his "outstanding contributions in the field of elevated-temperature magnesium alloys, particularly for inventing magnesium-thorium alloys."

His work is considered singularly important because of the contribution these alloys are making to the nation's defense weapons. The magnesium-thorium alloys are being used increasingly for supersonic aircraft and guided missile structural materials that must resist temperatures as high as 700 degrees F.

The Dow award was established in honor of the company's late president and son of its founder. It's presented each year to the member or members of Dow's Magnesium Department adjudged to have made outstanding contribution to magnesium research within a preceding 5-year period.

ACHESON ELECTS SPRAGUE VICE-PRESIDENT

John C. Sprague

John C. Sprague, secretary-treasurer of Acheson Industries, Inc., New York, since 1941, was elected vice-president in charge of administration and finance at a recent board meeting in New York City, Howard A. Acheson, president, has announced. In addition to his new responsibilities, Mr. Sprague will continue to serve as secretary-treasurer, and will maintain his headquarters at Port Huron, Michigan.

Re-elected as officers of Acheson Industries, Inc., were: Howard A. Acheson, president; Raymond Szymanowitz, executive vice-president, M. W. Reynolds, vice-president in charge of international sales; P. C. Buck, vice-president in charge of engineering and production; and E. G. Clarke, vice-president in charge of European operations. Mrs. Leatha Tuer and Lester H. Miller were re-elected assistant secretary and assistant treasurer, respectively.

Members of the board of directors are: Howard A. Acheson, Raymond Szymanowitz, John P. Deringer, P. C. Buck, M. W. Reynolds, P. V. Heftler, E. G. Clarke and John C. Sprague.

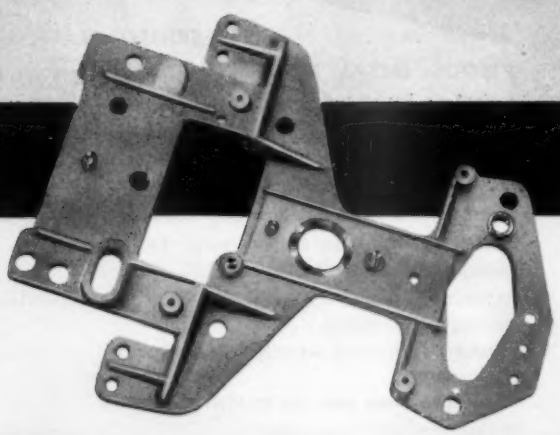
Acheson Industries, Inc. includes Acheson Colloids Company, Port Huron, Michigan, Acheson Dispersed Pigments Co., Philadelphia, Pa., and Acheson International Sales Co., Port Huron; also Acheson Industries (Europe) Limited, London, England.

ELECTED AT PRESSCO

Effective May 1st, Mr. J. R. Metcalf has been elected Vice-President in Charge of Production. He has been with Pressco Casting & Mfg. Corp. for some length of time, but was formerly Manager of Production for Kiekhaefer Corporation.

SHORT RUN DIE CASTINGS IN ZINC PRODUCED THROUGH

MODERN Craftsmanship from Phoenix



We, at Phoenix, are not Swiss watch-makers, but we do pride ourselves on producing some of the most intricate, close tolerance zinc die castings made today for some of the most respected names in American industry. Coupling modern production facilities and techniques with a good measure of care and "pride in a job well done" has enabled us to build an enviable reputation as a prime supplier for short run, precision work. And the really tough jobs, with many extra operations, don't faze us a bit . . . as a matter of fact, we thrive on them! In addition, should you encounter a zinc die casting problem, our engineering department stands ready to give you the kind of able assistance you need to solve it. Next time you need the finest in zinc die castings . . . think of Phoenix!

PHOENIX DIE CASTING CO.
21 ILLINOIS STREET BUFFALO, NEW YORK

For more information circle No. 44 on the Reader Service Card

FORGING TO CASTING

continued from page 41

directly. It is set face-to-face upon the drag from the previous cycle of the shell mold machine and the two halves are bound together with adhesive. Close tolerances between the cope and drag halves minimize objectionable fins in the finished casting. As the shell molds are removed from the closing machine they are placed on a mold storage conveyor with a capacity for 832 molds.

Before the molds are set in the trays, the trays are filled with about 1½ in. of backing sand. The sand is applied automatically by a Syntron vibratory feeder.

As a trolley conveyor carries the molds they are poured by a man on a moving pouring platform which is synchronized with the speed of the mold conveyor. The molds are then carried to either of two pre-selected shakeout stations, where trays are automatically tripped, discharging the castings, mold remnants and sand. Through a system of conveyors the backing sand is continually recirculated. Castings, sprues and the larger pieces of mold and core sand continue to the end of the oscillating conveyor, the last 21 feet of which serves as a picking table.

A high-speed friction cutting band saw is used to cut off the sprue and remove the castings from the gating system. The castings are shot blasted and then loaded into alloy trays for a normalizing and drawing operation. The sprue is shot blasted and returned to the charge make-up area.

Worthy of note is the fact that the foundry is the cleanest on record. A very extensive system of ventilation and dust control has been installed. Two wet-type and three dry-type dust collectors are used in addition to 11 ventilating fans. The entire foundry air is changed every three minutes.

KERSHAW HARMS DIES

Kershaw Harms, vice president of American Smelting and Refining Co. died suddenly on Friday, July 12, 1957. He was 58 years old.

Mr. Harms served with the company for 40 years in various capacities. He was made vice president in charge of the Federated Metals Div. in April, 1957.

MACNEIL NAMED V.P.

Arthur R. MacNeil has been named vice-president of MacDermid, Inc. Prior to his election to the vice-presidency, MacNeil was New England sales manager for the company; he will continue in this capacity along with his new duties.

MacNeil joined the company in 1945 as a technical sales representative for the line of metal cleaning, plating and finishing products made by MacDermid. In 1953 he was named New England sales manager.

Mr. MacNeil has a broad background in all phases of metal cleaning and finshing. He is past president of the Bridgeport chapter of the American Electroplaters' Society.

DATA IN ADS

Continued from page 48

36. Zinc Castings — Bulletin 101 from Lester-Phoenix, Inc., describes the many features of the 100 Ton Lester. One of the features is the "one-adjustment" zinc end and central die height adjustment.

54. Fire Resistant Hydraulic Fluids — are described in booklet F-40134 published by Union Carbide Chemical Co. "Ucon Hydrolubes Spell Safety" contains detailed information on the protection and economy features of the company's product.

DIE CASTERS . . . *Here's Added Savings!*

D-M-E CAVITY SETS

IN 6 NEW STANDARD SIZES

Check these **NEW** *sizes..*

IN D-M-E No. 1 STEEL

$14^{7}/_{8}$" x $23^{3}/_{4}$"
$16^{1}/_{2}$" x $23^{3}/_{4}$"
$19^{1}/_{2}$" x $23^{3}/_{4}$"
$23^{3}/_{4}$" x $23^{3}/_{4}$"
$23^{3}/_{4}$" x $29^{1}/_{2}$"
$23^{3}/_{4}$" x $35^{1}/_{2}$"

STANDARD PLATE THICKNESSES FROM $^{7}/_{8}$" to $5^{7}/_{8}$"

ALL PLATES GROUND FLAT and SQUARE

Ready for your die layout and cavity inserts

Precision Ground LEADER PINS and BUSHINGS

For accurate alignment and longer wear

Write Today for . . .

D-M-E's 12 page Brochure giving Complete Prices and Specifications

DETROIT MOLD ENGINEERING CO.

6686 E. McNICHOLS ROAD — DETROIT 12, MICHIGAN — TWinbrook 1-1300

Contact Your Nearest Branch FOR FASTER DELIVERIES!

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CHICAGO 51, ILLINOIS 5901 W. DIVISION STREET, MANSFIELD 6-2900
CLEVELAND 9, O. - D-M-E CORP. 502 BROOKPARK RD., SHADYSIDE 1-9202
LOS ANGELES 7, CAL. 3700 SOUTH MAIN STREET, ADAMS 3-8214

For more information circle No. 20 on the Reader Service Card

NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups in the precision metal molding industries

ACHESON NAMES RESEARCH AND DEVELOPMENT MANAGER

Arthur J. Stock

Arthur J. Stock has been appointed Research and Development Manager for Acheson Colloids Company, Port Huron, Michigan, a division of Acheson Industries, Inc. Mr. Stock replaces Dr. Harold J. Dawe who is now research director for Acheson Industries, Inc.

Mr. Stock was formerly a research chemist with The Truscon Laboratories Division of Devoe & Raynolds Co., Detroit, and production manager for Henneberry Rotogravure Co., Chicago. Before joining Acheson he was project director for Chicopee Manufacturing Corporation, Springfield, Mass.

NEW SHAW LINCENSEES

The Shaw Process Development Corp., Port Washington, New York, has announced the licensing of three of the country's outstanding producers of plastic molds, diecasting dies and forging dies: Kuhlman Diecasting Co., Kansas City, Missouri; Permanent Mold Die Co., Inc., Hazel Park, Michigan; and Manco Products, Inc., Melvindale, Michigan.

For full information and literature on the Shaw Process and its applications, write Department K-27, Shaw Process Development Corp., Port Washington, New York.

DUNNING JOINS METALWASH

Ranald G. Dunning has joined Metalwash Machinery Corporation of Elizabeth, N. J., as Manager of Research and Development.

Ronald G. Dunning

Mr. Dunning formerly Project Engineer and Project Analyst at Merck & Co., has installed a new and completely equipped Research Development Laboratory at Metalwash where he will supervise Research and Development Projects for the Company's four divisions which serve the Industrial Metal Parts Processing, Food Service, Bakery and Pharmaceutical markets.

In addition, Metalwash announces that its expanded research facilities, under the direction of Mr. Dunning, who will permit it to offer more research and technical service to its customers than ever before in the Company's 31 year history. The Technical Service Program, available to customers in all divisions, provides laboratory solutions to all types of soil removal problems.

REYNOLDS METALS CREATES SALES DIRECTOR'S POST

Ralph Fields, of the Reynolds Metals Company has been named to the company's newly-created post of director of sales promotion and merchandising for all consumer markets.

Ralph Fields

Announcement of Fields' new assignment was made in Louisville, Kentucky, today by Charles M. Mapes, general manager of consumer market sales.

In addition to his sales promotion and merchandising assignments, Fields also will act as coordinator for consumer sales meetings and sales training programs emanating from the company's Sales Training Department.

UNION CARBIDE APPOINTS BRINEY

Robert M. Briney has been appointed president of Haynes Stellite Company, Division of Union Carbide Corporation.

Mr. Briney started with the Corporation in 1924 in the Niagara Falls, N. Y. plant of Electro Metallurgical Company, a division of Union Carbide. He has held key positions with that division both in production and development at Niagara, as well as at Alloy, W. Va., and New York. In 1950, he was made vice-president in charge of wrought alloy products for Haynes Stellite Company in Kokomo, Ind., and transferred to the New York office in July, 1954.

CAVENDER ADDED TO CLEARING SALES FORCE

James Cavender

Jim Cavender has been promoted to the post of Sales Engineer to cover the Southern Ohio and West Virginia Territory for Clearing Machine Corporation, division of U. S. Industries, Inc. In making the announcement, E. J. Baumrucker, the firm's General Sales Manager said Jim's career with Clearing began in 1952 in the Assembly Department of the Hamilton, Ohio branch plant. He later became a service man and subsequently rose to the post of Service Manager in Hamilton where he makes his home.

WOODWORTH CO. PURCHASED

V. S. Lazzara, President, Casting Engineers, Inc., Chicago, Illinois, announced that they have recently purchased the investment casting business from the N. A. Woodworth Company of Detroit, Michigan. Mr. Lazzara further stated that arrangements have been made to offer customers a packaged service of cast and machined components with the N. A. Woodworth Company to perform the precision machining operations. A close liaison between the two companies will enable them to give customers prompt, efficient service of the highest quality.

This is the second acquisition made by Casting Engineers within recent weeks. They purchased the Midwest Precision Casting Division of the L. A. Darling Company of Coldwater, Michigan, early in June.

Casting Engineers, Inc. is a subsidary of Consolidated Foundries, Inc.

WORMSER REJOINS ST. JOSEPH LEAD

St. Joseph Lead Company announced today that Felix E. Wormser, former assistant secretary of the Department of the Interior, has rejoined the company as vice president. Mr. Wormser first became associated with St. Joseph Lead Company on May 15, 1947. He served initially as assistant to the president and on May 10, 1948, he was elected vice president of the company. On May 1, 1953, he left the company to become assistant secretary of the Department of the Interior.

DIVERSEY CORP. APPOINTS DISTRICT MANAGERS

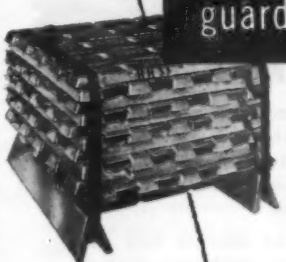
R. E. Perry, General Sales Manager of the Diversey Corporation, has announced the appointment of four new district managers in the firm's Central Division.

They are Sidney E. Cadieu, Dunbar, Wisc.; Kenneth O. Green, Monmouth, Ill.; James P. Raleigh, Overland (St. Louis), Mo.; and Walter C. Rohn, Wilmette, Ill.

Each of the new managers is a recognized food sanitation specialist. In their new positions, they will direct the work of Diversey's sanitation fieldmen.

you have a quality-control watcher in **our** plant!

the **HENNING** spectrograph guards the purity of your alloys



Henning alloy bars are shipped to you on consumable skids of the same alloy at no extra charge, and each bar is stamped to identify the alloy.

Henning's modern metallurgical control methods for quality ingot production include spectrographic analysis of every heat. No other method will give such accurate and precise results.
Just as important is the ability of H.B. & S. metallurgists to produce large uniform heats. And every heat is given an identifying number, which is your assurance of thorough inspection at every stage of production.

Write today for a copy of H B & S' Helpful Alloy Wall Chart

HENNING BROS. & SMITH, INC.

Brass, Bronze, Aluminum Ingot Alloys. Zinc-base & Zamak Die-Casting Alloys

"Dependable Service Since 1922"
91-117 Scott Avenue, Brooklyn 37, N. Y.

For more information circle No. 29 on the Reader Service Card

For more information circle No. 51 on the Reader Service Card

On The LEVEL

You Can't Buy Better ALUMINUM

ALLOY DIE CASTINGS AT *ANY* PRICE!

The same unexcelled Quality and Service which has made the name of **STROH** foremost in Zinc die casting for fifty years, will govern our new Aluminum facilities. When you deal with **STROH** you deal with a company of over half a century of concentrated experience.

The name guarantees the result.

INQUIRIES INVITED!

STROH DIE CASTING Co. INC.

11123 W. Burleigh St., Milwaukee 10, Wisconsin

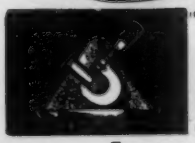
Precision Made . . . For Precision Performance

POWDERED METAL PARTS

precision made from exclusively formulated non-ferrous Sintroloy and Ductiloy are molded to close tolerances, thereby eliminating machining of intricate shape and high scrap loss.

Perhaps we may be able to help you solve specific parts problems. Get in touch with National Molded today for prompt attention.

Write today for detailed information and free literature on cost-saving standard bearings which are available from stock.



NATIONAL MOLDED PRODUCTS, INC.

40-42 S. ST. MARYS ST. • ST. MARYS, PA.

For more information circle No. 40 on the Reader Service Card

ALLOY PRECISION EXPANDS FACILITIES

Alloy Precision Castings Co., a subsidiary of the Mercast Corp., an affiliate of the Atlas Corp., is enlarging its plant in Cleveland, Ohio. The addition will double the existing facilities and increase the number of employees by 50 percent before the end of the year.

CARPENTER STEEL APPOINTMENTS

George Bennethum has been appointed assistant manager of alloy steel sales for The Carpenter Steel Co. and T. Allen Washburn has been named assistant manager of tool steel sales.

Bennethum has been assistant manager of tool steel sales since January, 1955 and Washburn has been a sales representative in the Indianapolis territory since February, 1953.

SALES AGENTS FOR AUTO-DIESEL

The Auto Diesel Piston Ring Co., Cleveland, Ohio, has announced the appointment of the Clifford-Rockwell Co. of Detroit, Mich., as sales representatives. The sales territory to be covered will include Michigan, North-Western Ohio and North-Eastern Indiana.

MILLAR TO BOARD OF DIRECTORS

Turco Products Co., manufacturer of industrial chemical processing compounds, has announced the appointment of Richard W. Millar to the board of directors. Announcements was made by S. G. Thornbury, president.

OAKITE REPRESENTATIVE

Oakite Products, Inc., manufacturers of metal cleaning and treating chemicals, have announced the assignment of two technical service representatives.

J. Edouard Sauve, who has represented Oakite in Marion, Ohio for the past five years, joins the Detroit staff and will serve the metal industries in the north-eastern metropolitan area. Peter J. Texier, Jr., since 1952 a member of the technical staff of Oakite's service laboratory, has been assigned to serve the metal industries in south Buffalo, N. Y.

JOBBINS DISTRIBUTOR

William F. Jobbins, Inc., has announced the appointment of Alloys & Chemicals Mfg. Co., Inc. as a distributor of its patented alloy, Almag 35.

The alloy will be stocked in both Cleveland and Detroit.

OPPORTUNITIES

jobs & equipment

Opportunities rates: $20 for the first column-inch; $15 for each additional column-inch payable in advance. To answer box number advertisements, address responses to the box at Precision Metal Molding, 812 Huron Rd., Cleveland 15, Ohio. Closing date: 1st day of month preceding publication.

POSITIONS WANTED

POSITION WANTED: Engraver and Die Sinker for small dies. Over 40 year experience. State hourly and overtime wage scale. Reply Box No. 8157.

DIE CASTING EXECUTIVE—Wide Managerial, administrative and process experience past 17 years. Proven ability. Present position Production Manager medium sized casting plant. Seek position with ambitious progressive organization. Size and location immaterial. Write Box No. 8257.

POSITIONS OPEN

METALLURGIST-RESEARCH AND DEVELOPMENT

We have an opening in our Materials and Processes Section for a metallurgist or chemical engineer who is interested in a career in die casting. We have exceptional laboratory and production facilities, and a chance for you to grow with us. Extra benefits include retirement plan, patent and imagineering awards, and advanced educational grants. Stimulating research program and working companions. Excellent suburban living conditions. Write for interview.

Mr. Frank A. Martin
The Hoover Company
North Canton, Ohio.

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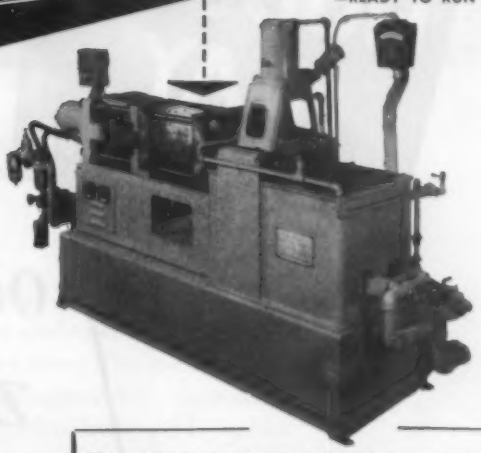

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